SCIENTIFIC AMERICAN

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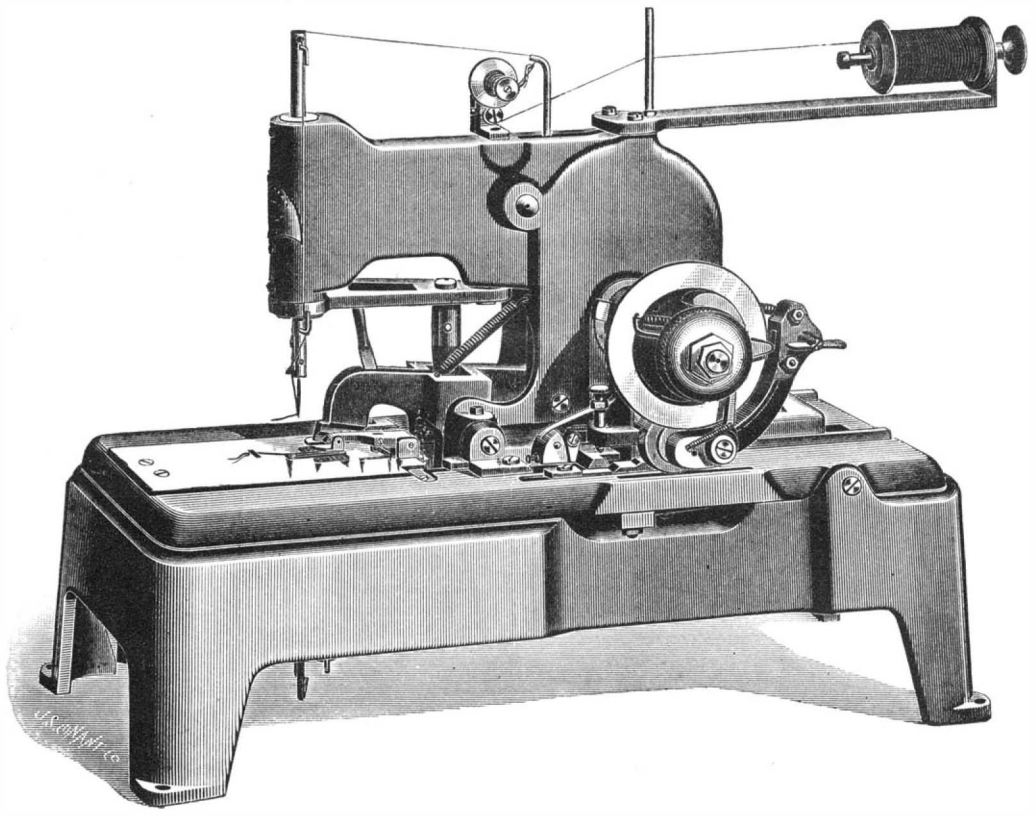
THE REECE BUTTONHOLE MACHINE.

Of all the exhibits at the World's Fair there is none that attracts more attention than that of the Reece Buttonhole Machine Company, of Boston. Their main exhibit is in Machinery Hall, and they also exhibit and do all the buttonhole work in the Model Shoe Factory in the special Shoe and Leather building. In this building shoe manufacture is practically exemplified as carried on in the leading shoe factories of the country, a thousand pairs a day being made, and the improved machinery used, including all the best machines which have been practically successful. The introduction of the Reece machine in shoe factories effected a saving in manufacture of from 40 to 50 cents a case.

The machines manufactured by the Reece Buttonhole Machine Company have been in practical use throughout the world for the past ten years, and their introduction in the trade reduced the expense of buttonholes 75 per cent. The buttonhole machines put out by this company were the first machines to automatically cut, stitch, and bar a buttonhole, reducing the labor of the operator to simply the moving and clamping of the material. The stitching mechanism is rotated about the eye, thereby saving any turning of the fabric which is being stitched, and the movements of the machine are all easy, uniform, and positive, and no important movements are dependent upon springs; the stitching mechanism is very simple, consisting of a looper and needle below the cloth plate and a needle above said plate. These parts receive their movement from a compound eccentric, and they make a complete buttonhole or purl stitch for each reciprocation of the needle bar, which makes the machine capable of running at a high rate of speed as well as noiseless and durable. The buttonhole is automatically cut and transferred from cutter to stitcher by an even, uniform movement, avoiding any jar or blow.

The starting and stopping of the stitching mechanism at the commencement and finish of the buttohole are automatic, the needles always stopping out of the fabric. The machine runs equally well on all kinds of materials, either with silk or cotton thread. The company has on exhibition machines for making eyeletholes and buttonholes of various styles required by the different trades, such as boots and shoes, clothing, collars and cuffs, underwear, and, in fact, everything that requires a worked buttonhole, and they have at least five different methods of barring the small end of the buttonhole, each of which is equally well adapted to its particular line of work.



THE REECE BUTTONHOLE MACHINE

Upon which 10,010 buttonholes have been made in 9 hours and 50 minutes.

When it is taken into consideration that at the time the Reece buttonhole machine was invented it required thirty-five hand movements to make a buttonhole on the best organized machine, and that the introduction of the Reece machine reduced this to two hand movements, the magnitude and importance of this invention can be more fully appreciated.

The latest production of the company is a buttonhole machine that makes any size buttonhole, from a round eyelet, such as is used in a shirt front, to a buttonhole two inches long, used in ladies' cloaks. The invention of this machine has greatly simplified the mechanism and reduced the labor of the operator to one-half what it previously was, the production being correspondingly increased. The machine is entirely automatic and requires no labor on the part of the operator, such as closing the work clamp by the foot or hand, as in the previous Reece machines, reducing the labor to simply moving the material from one to the next buttonhole. A series of any number of buttonholes can be cut, stitched, and barred without the operator moving her hands from the material and without any movement of the foot. This machine is the first ever produced that barred the buttonhole with a purl bar, which makes the small end of the buttonhole in harmony with and equally as neat as the sides, and crosses the stay cord and firmly stitches it together, so that there is no possibility of its starting.

The company has also put upon the market for the past five years a machine for stitching down the thrum ends and stay cord between adjacent buttonholes on shoes by a blind stitch. These machines are entirely new and opened a new field for sewing machines, as this work had always been done by hand. One of these machines and an operator now take the place of ten hand operators, and the work is far superior to that done by hand, making a neat, uniform finish on the inside of the shoe.

THE WORLD'S COLUMBIAN EXPOSITION—EXHIBIT OF THE REECE BUTTONHOLE MACHINE COMPANY OF BOSTON.

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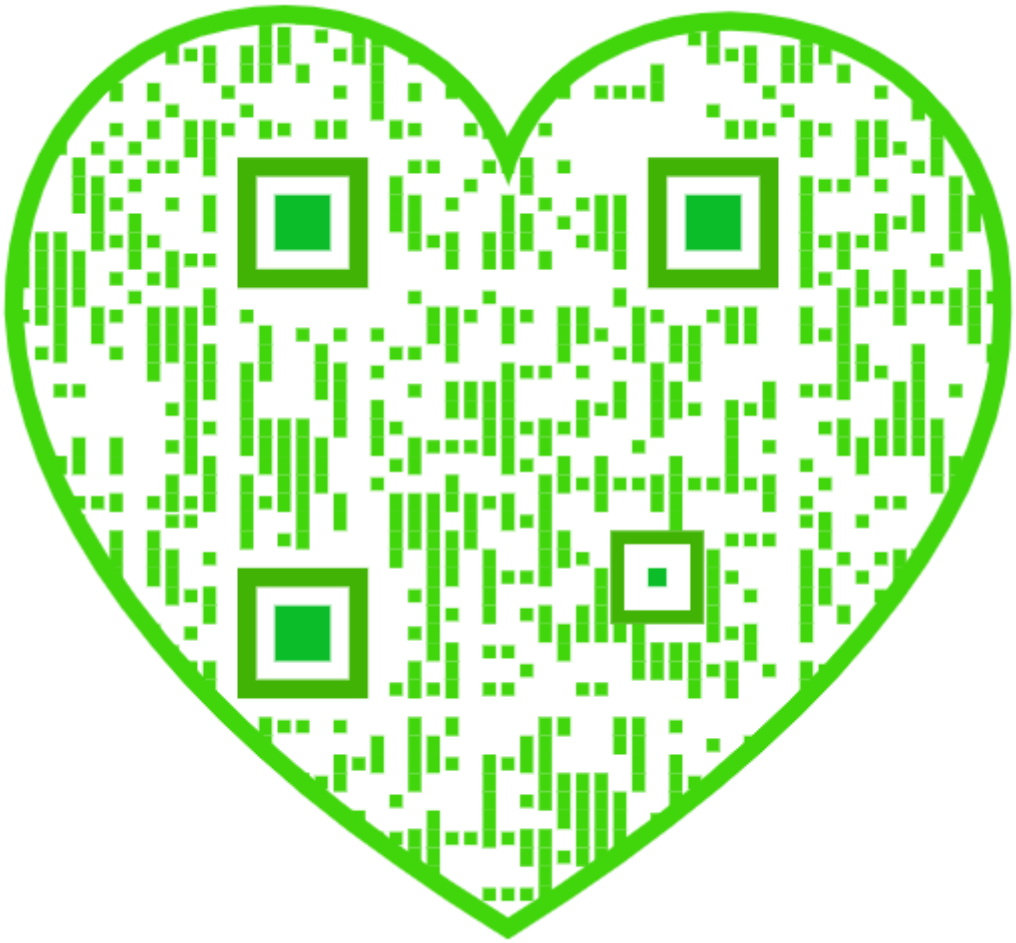

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CONGRESS ON PATENTS, TRADE MARKS AND INVENTIONS.

On October 2 the World's Fair congress devoted to patents, trade marks and inventions opened its sessions in the Art Institute, of Chicago. Among those participating were: Dr. R. J. Gatling, the inventor of the Gatling gun and president of the American Association of Inventors and Manufacturers; Everhard Faber, of this city; Judge Henry W. Blodgett, who held the position of permanent chairman of the congress; Richard Pope, Canadian Commissioner of Patents, and others well known either as lawyers, manufacturers or inventors. Judge Blodgett in his opening address spoke principally of what invention had done for the great farming regions of the Northwest in the production of improved harvesting machinery. These inventions alone have made it possible to harvest the enormous crop of the grain-producing area. As the management of this machinery requires a considerable degree of mechanical skill, the speaker held that it had operated to develop the intelligence of the population, as well as to admit of improved farming apparatus, thus bringing about a two-fold benefit. Dr. Gatling delivered an address of welcome on behalf of the American association, briefly recapitulating the well known story of American patents. Rowland Cox, of the New York bar, read a paper on trade mark law, taking the ground that it is a fortunate thing that in adopting the constitution of the United States, trade marks had been left out of the patent statutes. His contention was that they should be awarded what they have received, namely, the common law protection, holding that a constitutional provision for them would have degraded their common law right into a statutory privilege.

Mr. Faber, in an address which he delivered on the next day, rather took the opposite ground, feeling that the United States should make some statutory provision for the protection of trade marks, if it was only for adequate registration thereof. He cited a directory of trade marks of stoves, which was issued a few years ago, which showed that all but one brand or name given were used by from two to five different manufacturers. A Bureau for the International Registration of Trade Marks has been established at Berne, Switzerland, in connection with the International Union, but, so far, no provision for registration of trade marks by citizens of this country has been made. Expensive litigation or long advertising seemed to him the only way of determining right of priority in trade marks. It will be seen that to some extent his views were the opposite of those of the distinguished lawyer, Mr. Cox, who preceded him in this subject. Lemuel W. Serrell, of this city, read a paper on the uniformity of patent laws, incidentally pleading for a more liberal construction of patents on the assignment of a reasonable period of public use which should not invalidate a patent. Papers by Dr. Gatling and by L. L. Bond, of Illinois, were devoted largely to the same subject, the epoch-making and great inventions of the world. Mr. Francis Forbes, of New York, formerly delegate from the United States to the Madrid convention of the International Union for the Protection of Industrial Property, spoke on the international law of trade marks. Other very able addresses signalized the meeting, some of which will be found outlined on page 246.

While these gentlemen were laboring at Chicago in the very midst of the most wonderful exposition of inventive genius the world has ever known—an exposition which never could have been realized except for the beneficent influences of the American patent laws—another set of men, assembled in the Congress of the United States at Washington, were at work in the unwise business of trying to emasculate and break down the system which has conferred such marvelous benefits upon the country.

The Hon. Mr. J. T. Heard, of Missouri, introduced a bill (H. R. 84) to prohibit inventors from bringing suit against individual infringers of patents, thereby allowing such infringers to take possession of and enjoy the labors of the inventor, without compensation to him, thus legalizing robbery.

The Hon. Mr. John Davis, of Kansas, introduced a bill (H. R. 3433) reducing the term for which patents are granted from seventeen years, which is the present term, to seven years. This law if passed would deprive nine-tenths of all inventors of any emolument from their inventions, and we presume that is the object of the bill.

The Hon. Mr. J. F. Lacey, of Iowa, introduced a bill (H. R. 1989) authorizing Congress, by a special act, at any time, to nullify any existing patent on payment of from twenty-five thousand to one hundred thousand dollars. The value of many patents is reckoned by millions of dollars, especially such as telephone patents, electrical railways, sewing machines, and hundreds of other new inventions, that confer inestimable benefits upon the people. This law legalizes the taking away of the inventor's property without due compensation.

The Hon. Mr. O. M. Hall, of Minnesota, introduced a bill (H. R. 1985) to prevent the inventor from obtaining any compensation for the use of his invention from "innocent users of patented articles."

We regret that not a single member of Congress has brought forward a bill to facilitate, protect, or assist the innocent inventor in securing reasonable rewards for his labors in benefiting the country by discovering new processes and inventions. It seems to us the true policy is to pass laws to foster, encourage and promote the establishment of new industries, not to break down and chastise the authors and inventors thereof.

BLOWING UP A WRECK.

Recent heavy storms along our coast not only created sad havoc, destroyed much property and ended many lives, but they left in their track many dangers which make possible future disasters. Among these may be mentioned derelicts and sunken wrecks. Of the former there are now some twenty along our coast, endangering the coastwise trade as well as the transatlantic trade.

From time to time, the Hydrographic Office of the Navy Department receives notices of the positions of these derelicts from the various ships that have sighted them. This office issues a monthly chart showing the positions of the derelicts, and it is interesting to note how they drift with the currents and winds.

There are also a number of sunken wrecks, whose masts and rigging project above the surface of the water. These, being in shoal water, are near the coast, and are particularly dangerous to our coastwise trade.

A ship running into a derelict or sunken wreck is in as great danger of serious injury as if she had collided with a ship under way, and the ugly point about the derelict is that it carries no lights, and on a dark night it would be impossible to see it in time to avoid the danger. The brave seaman must rush boldly on and trust to the "cherub who sits up aloft" to guide him clear of the masked foe.

The increasing commerce of the world has made apparent the necessity of doing something for the lessening of this danger and for some time past there has been serious discussion of a plan to have an international arrangement for the removal of wrecks. The plan proposes that each country take upon itself the task of keeping clear a certain definite section of the frequented parts of the ocean. At the present moment there is an endeavor to secure legislation on the subject in Congress. There is a strong possibility that our government will detail a vessel, probably a sea-going tugboat, to this duty, equipping her with the necessary gear, as hawsers, grapnels, tackles, kedges, explosives, torpedoes, electric machines, and means of setting fire to dangerous floating wrecks.

Recently the old war veteran the U. S. S. Kearsarge was sent to destroy a particularly dangerous wreck off the entrance to Delaware Bay. It may not be without interest to describe her experience, methods and the results.

She left New York on September 27, and on the morning of September 28 arrived near the position of the reported danger. The position had to be accurately determined by astronomical observations, for no land or lighthouse was in sight from which to reckon by compass bearings.

The danger sought had been described as two spars sticking out of water to the height of about eighteen feet, a rather small object to see on the sea even in daylight unless close to it.

Arriving on the exact position as reported, nothing could be seen of the spars. Search was begun on the plan used in the Coast Survey when looking for a shoal spot. It is known as the "starring" method or "running radials." This consists in running a few miles on any given course, then steering a course at right angles for a few miles, then steering for the original position, passing it and standing on for a few miles, turning at right angles, running a few miles and then turning and running again for the original position. This method, if continued, will cause the ship to describe a sort of Maltese cross around the original position. All this time a bright lookout was kept, many men being on the watch for anything that looked like a spar sticking out of the water.

The second tack brought success, and the ship was soon at anchor near the wreck. The exact position was latitude 39° 3′ north, longitude 74° 9′ west. The wreck was that of a very large three masted schooner. The hull was on the bottom in seventeen fathoms of water, but the masts, with other wreckage, held in some manner by the rigging to the hull, projected above water. One of them was upright, but two of them were inclined, and all were bobbing around in the heavy sea in such a manner as to make it extremely dangerous to approach them in a boat.

A cutter, in charge of the ordnance officer, left the Kearsarge and went to the wreck. Soundings were taken over the wreck, and the officer's investigations led to the conclusion that the decks of the hull must have split, and that the only part dangerous to navigation was the floating wreckage, masts, spars, etc., that remained attached to the hull.

The problem then resolved into blowing up or

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tearing away this wreckage. A gun cotton torpedo, wires and an electric machine were then placed in the boat, and the boat proceeded to the wreck. A line was loosely placed around one of the masts, forming a sort of grommet. The torpedo was fastened to the grommet and lowered about thirty feet under water, the grommet keeping it near the mast. This was a very dangerous part of the operations, on account of the plunging of the masts and boat in the heavy sea, and it required all the strength and skill of the twelve hearty seamen to keep the boat from being swamped or crushed.

After the torpedo was lowered the boat pulled away to a distance of about five hundred feet, paying out on the electric wires. Arriving at this distance, the electric machine was put in action, the circuit tested, a button pressed, and an explosion followed which shattered the mast.

A second torpedo was in like manner taken out and secured to one of the remaining masts, but the wires becoming foul of the wreckage, the circuit was broken and the torpedo could not be exploded. It was then decided to try and pull one of the masts clear. The Kearsarge hove up her anchor and steamed over near the wreck.

A large hawser was taken out by the boat and made fast to one of the masts. When all was ready, the Kearsarge backed on her engines, tugging away at the hawser. The mast pulled under water, the hawser surged and strained. The mast had a good hold on the wreck and would not let go. Something had to come. So the hawser parted.

The hawser was again taken out by the boat, and this time it was made fast to the third mast. The Kearsarge backed as before, and after tugging for several minutes, till it seemed as though the hawser was again about to part, the mast broke adrift from the wreck. From an examination of this mast and the rigging, and parts of sails that still clung to it, it was evident that the schooner had been capsized in a sudden squall with all sail set. Probably all hands were lost.

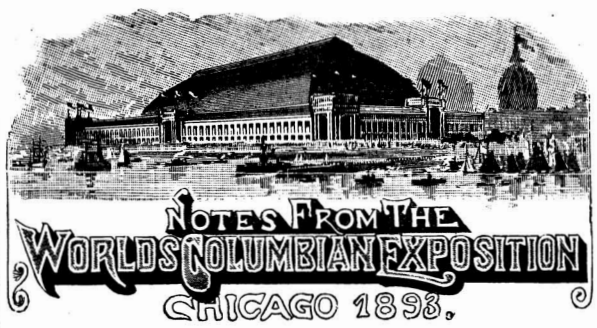
The big mainmast remained to be got rid of. A third torpedo was put in the boat, the wires were carefully overhauled, all connections examined and the boat proceeded to the wreck. This torpedo was attached to the mainmast as the others had been, the boat pulled to a safe distance, and the torpedo was successfully exploded, so successfully in fact as to cause by its concussion the explosion of the second torpedo. There were two distinct explosions, following each other very closely, probably within a second. The pieces of the splintered spars floated off, the wire and rope rigging and sails sank to the bottom and the wreck was no longer dangerous to navigation.

The electric machine used was a Farmer dynamo-electric, series-wound machine, of eighteen volts and 3·6 amperes. Twelve hundred feet of number fourteen gauge, copper, rubber-insulated wire were used. The resistance of the wire was three ohms per mile, with 96 per cent conductivity. The insulation resistance is one hundred and fifty megohms.

The fuse bridge had a resistance of 0·69 ohm and required 0·89 ampere to fire the fuse. The torpedo consisted of an iron casing containing thirty-four pounds of wet gun cotton with a dry priming charge of 2·7 pounds.—*Brainard.*

Thirty Knot Steamers.

Mr. J. H. Biles, the designer of the Paris and New York, suggests the possibility of 30 knot steamers in the future. Ten knots must be added to the present speeds. Of this Mr. Biles proposes to gain two knots by the use of nickel steel instead of ordinary steel, then three and a half knots by the use of oil instead of coal as a fuel, and the remaining four and a half knots he believes can be secured by such changes in dimensions as will increase the length and draught and by improving the machinery. The length will be about 1,000 ft., and the beam 100 ft., with a draught of 30 ft.



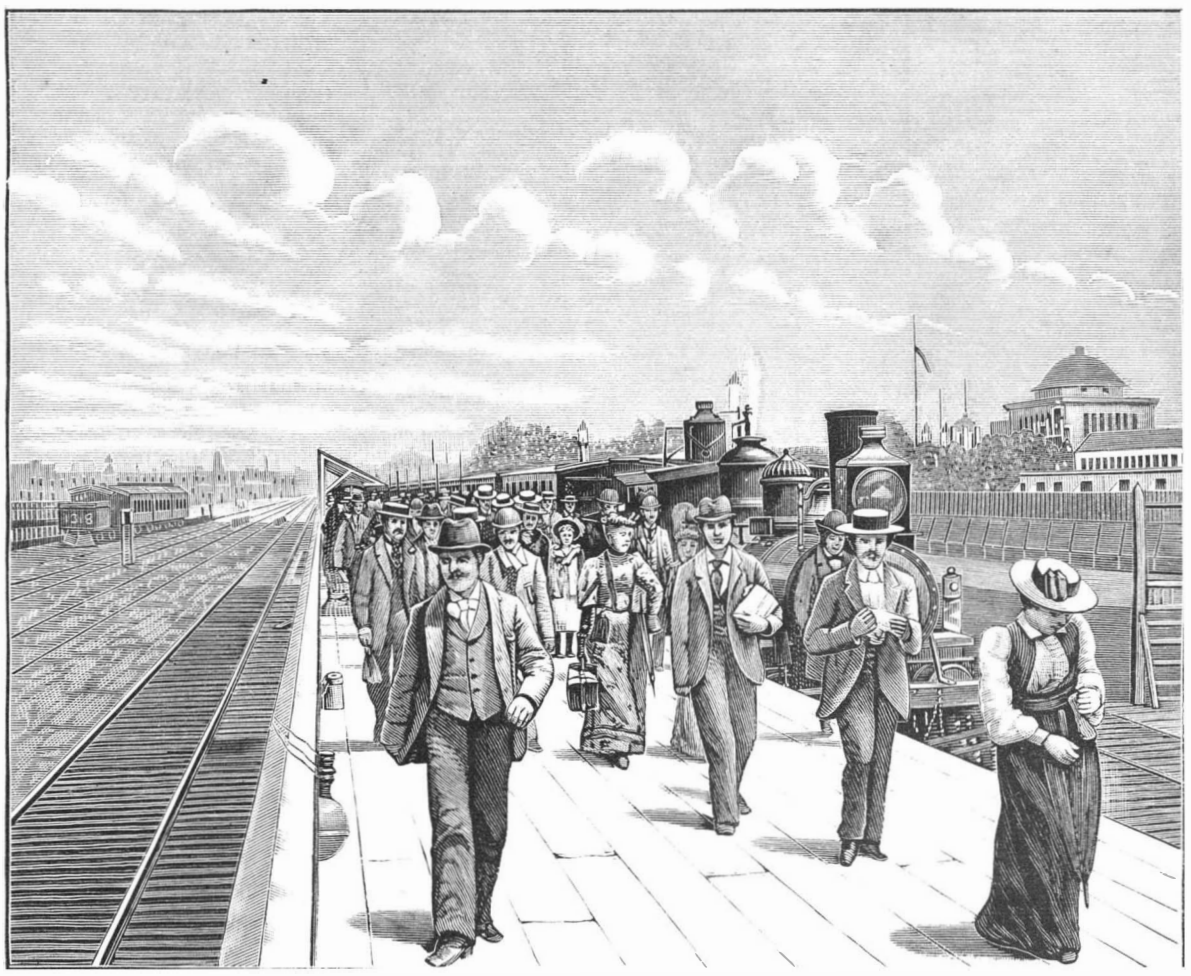
The National Wall Paper Company makes an exhibit at the World's Columbian Exposition based on the principle that such an Exposition as this is intended to show the latest achievements in the various arts and manufactures. This company comprises twenty-three of the leading wall paper manufacturers of the country. The designing of the structure and the work of decorating and placing the exhibits is due to Mr. Paul Groeber, one of the leading designers of wall paper. There are five separate rooms, one being a central or inner court, which Mr. Groeber has decorated in a manner to show the very latest achievements in wall paper manufactures. This room is two stories in height, open to the top, and is papered in the Empire style, in what is called aplique relief print, and is all hand work. The design stands out in bold relief. This is accomplished by the use of flexible pigments, instead of by embossing the paper, so that the paper can be rolled or wet without injury. Over two hundred hand printing blocks were required in printing the paper. The silk draperies and velvet carpeting were designed and manufactured to harmonize and correspond with the papering. Pilasters of this aplique relief paper form an important part of the decoration and they stand boldly out. The other four rooms are devoted to the display of various kinds of paper, which embraces the nicest of hand work. The best machine work is also displayed, so that grades of paper are to be seen here ranging in price from 50 cents to $24 a roll. One large case is full of paper that has the rich sheen of satin, but which is made entirely of pulp. That satin effect is given by the use of pulverized mica in making the paper.

In the house furnishing section, one of the most striking novelties is a large exhibit of rattan furniture, comprising three rooms. The face of the structure is covered with rattan and woven cane. There is a reception room, sleeping apartment and parlor, all the furniture of which is made of rattan, while the cornice, ornaments, decorating of the mantel, and the grilles are of the same material.

Stove manufacturers have vied with each other in making large and complete displays. One of the most noticeable exhibits is that of the Garland stoves. There is a superstructure 25 feet high, 30 feet long and 20 feet wide, arranged in the form of a huge kitchen stove. In this exhibit is shown what is believed to be the oldest stove in America. It was brought from France in 1693 and placed in the first convent established in Quebec. It is the ordinary type of box stove, and nearly square. The castings in it would be considered excellent work in stove making to-day. In another exhibit there is shown the first anthracite self-feeding base burner made. This stove was invented by the late Dr. Nott, who was president of Union College, New York. It is believed to date back to 1817.

Few people who have attended the Exposition have appreciated the importance of the Emergency Hospital; although probably they have been terror stricken by the apparently reckless manner in which the hospital ambulances dash around the promenades. There have been an average of over one hundred hospital patients a day since the opening of the Exposition. The largest percentage is the people who keep on going in their sightseeing until they fall exhausted, and in many cases the attending physicians say indigestion brought about by irregular eating has played an important part.

St. Thomas, one of the West Indies Islands, discovered by Columbus, is vividly represented by a model in the Transportation building, which is made on the scale of six inches to a mile horizontally. The outlines of the island are an exact reproduction of the sea beach in miniature, and palm groves, towns, harbors and shipping are shown in the naturalness of real life. Among the vessels represented in the harbor are United States cruisers and two of the Columbus caravels now to be seen at the Exposition.



ARRIVALS AT THE FAIR—ILLINOIS CENTRAL RAILROAD.

An exhibit made by the Horticultural Department in a section of the Midway Plaisance causes surprise, but is very practical in its way. It is a section of an old rail fence overgrown by a vigorous growth of ordinary garden weeds, which are described by a card as "Things to hit with a hoe." Nearly all of the more troublesome weeds are to be seen here.

Probably very few of the millions of people that have visited the Exposition have thought of the busy scenes that must be enacted after the gates to the grounds are closed to the public for the night. A glimpse late in the afternoon of the plaza around the Administration building and of the benches surrounding the basin and lagoons reveals an amount of rubbish in the shape of packages, papers, and boxes remaining from lunch parties that would fill a great many wagons. Every night, promptly at eleven o'clock, an army of men goes over the grounds gathering up all the rubbish, which is then burned. Another army follows with sweepers, cleaning up and repairing the promenades and repairing breaks in the lawns. Following these come the sprinkling carts. This work consumes the greater part of the night. As early as three o'clock A. M., provisions and supplies of all kinds begin to arrive at the various gates.

The Chicago, Milwaukee and St. Paul Railroad exhibits a light and heat tender in the Transportation building, which has been used on its vestibuled express trains. The car weighs 76,000 pounds. It is fitted with a boiler of the locomotive type, which carries steam at a pressure of 100 pounds. Five thousand pounds of coal and 300 gallons of water can be carried in the fuel and water tanks. These tanks and the boiler occupy about three-fifths of the car. In the remaining space is an electric plant, consisting of a Westinghouse automatic engine of eighteen horse power, belted by a link belt to an Edison fifteen kilowatt 110 volt dynamo. This tender has been used continually in winter on limited trains of ten cars each running between Chicago and Minneapolis, and has not only supplied necessary steam for heating the train, but has also maintained 200 incandescent lamps of sixteen candle power each.

The General Electric Company shows in one of its spaces in the Electricity building the first dynamo that Mr. Edison built, and it is an interesting fact that the Edison dynamo of to-day does not differ from this first one except in minor detail. This dynamo was one of fifteen used at Menlo Park, N. J., for the first public exhibition of incandescent lighting. It was built in 1880, and has been in constant operation until it was brought to the Exposition.

(*Continued on page 246.*)

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A FOLDING AND RECLINING CHAIR.

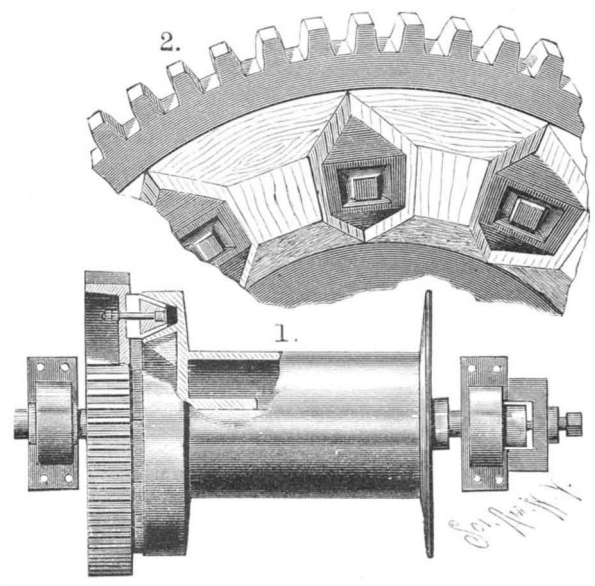
In this chair, which has been patented by Mr. Willis J. Moreland, of Mottville, N. Y., the construction is such that the footrest may be carried upward at its outer end above the level of the seat when the chair is in position for reclining, and the chair will balance in any position in which it may be placed

MORELAND'S FOLDING CHAIR.

without fastenings of any kind. The side pieces of the back of the chair are pivoted to the rear portion of a seat of ordinary construction, and the side bars of the footrest are pivoted to the forward portion of the seat, but these side bars have outward curved end portions extending above the seat, and pivotally connected by connecting bars with the arms of the chair. These connecting bars are hinged to the under faces of the arms, beneath which the bars may be rearwardly folded. The pivotal connection between the footrest and the arms is in advance of and out of vertical alignment with the pivotal connection between the footrest and the seat, enabling the chair to be balanced in any position by the body of the occupant, whether sitting or partially or fully reclining, and requiring for this purpose no ratchets or other fastening devices. Side pins in the footrest are also adapted to enter recesses in the upper forward ends of the rear legs when the chair is set up for use. This chair may be compactly folded for shipment, as shown in one of the views, and it can be manufactured at a moderate price.

AN IMPROVED FRICTION CLUTCH.

This clutch consists of a wheel having in one face an annular groove in which are set friction blocks to form a continuous friction rim, presenting even and well wearing surfaces, set end wise of the grain, for frictional contact with the clutch wheel. The improvement has been patented by Mr. Gust. Pers. Wern, M.E., No. 635 Eleventh Street, Brooklyn, N. Y. Fig. 1 is a side view showing the application of the improvement, Fig. 2 representing a face view of the friction wheel, with the sockets and heads of the bolts in the friction blocks, by means of which the latter are secured in position. The friction wheel is secured in the usual



WERN'S FRICTION CLUTCH.

manner on the shaft, to be thrown into frictional contact with the flange of the hoisting drum or other machinery. By securing the friction blocks in their places in the manner shown, one or more of the blocks may be readily removed and others substituted, when necessary, from wear or injury, without disturbing the other blocks. The wheel thus made has inside as well as outside friction surfaces, and presents even and hard contact faces designed to outlast almost any hoisting engine doing heavy duty. It has less than the usual angle of friction cone, but with more friction capacity, will run cool, and damp or dry air does not affect or change the shape of the friction surfaces. The improvement may be readily applied to any hoisting drum, on new or old engines of any makers.

Improvement in Thermometers.

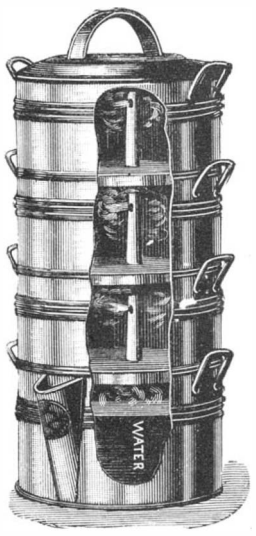
Mr. Lupin, of Munich, has recently called attention to two thermometers that are free from certain inconveniences that are presented by those filled with alcohol. One of them is obtained with sulphuric acid diluted with water. According to the experiments of Sohncke, the quantity of water abstracted by distillation in the thermometric tube is trifling, even when the free extremity is surrounded with ice, and, what is still more important, this small quantity of water is reabsorbed in a short time. The expansion of the liquid column is nearly constant. Mr. Vogel made use of this apparatus in the course of an expedition in Brazil, and obtained very satisfactory results with it.

The other liquid is a solution of chloride of calcium in spirits of wine (10 to 15 per cent of the anhydrous salt is the best proportion). This is especially recommended for medical uses on account of its pronounced color, which facilitates readings. It gives no rise to error, either, in consequence of distillation, and, besides, presents the advantage of taking the temperature of the body very rapidly, say in about three minutes. The regularity of expansion, although less perfect than with sulphuric acid, is satisfactory between 0° and 50° C.

These two solutions do not solidify, even at the temperature of evaporation of snowy carbonic acid, and, with the proportion of salt indicated, there is no deposit in the reservoir.—*Revue Scientifique.*

THE BEVERIDGE AUTOMATIC COOKER.

This cooking apparatus has four vessels, three cooking compartments and a lower vessel holding water. When placed upon a stove or range, and the water brought to boiling heat, the steam generated passes up into the several compartments by means of a small connecting pipe on the inside. A greater or less number of compartments may be used as desired, and the construction is such that each compartment is entirely separated from the others, so that the flavors are not mingled in cooking various kinds of food, and food thus cooked in entirely closed receptacles retains all its nutritious qualities. A whole meal can thus be cooked at once over one fire or one burner. This cooker is manufactured by W. E. Beveridge, No. 305 South Sharp Street, Baltimore, Md.



A CHEAP AND EFFICIENT MOTOR.

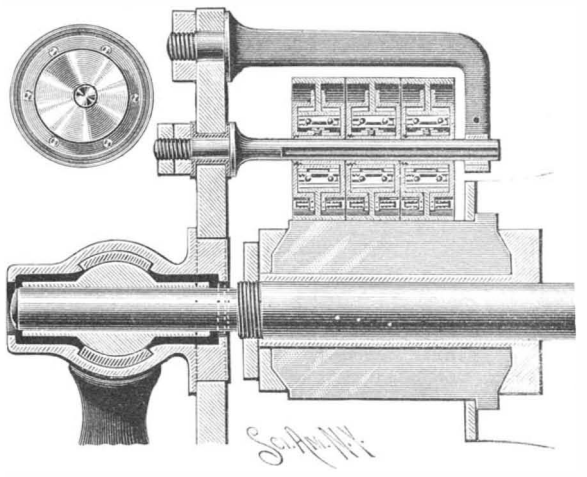
The ease and simplicity with which such a motor as the one shown in the illustration may be set up and utilized to do a great variety of work will be apparent at a glance. Supposing the house or shop to be supplied with water under pressure, the motor is preferably secured in position at a washstand, sink, or hydrant, the fittings being adjustable to all sizes of faucets or spigots without alteration. It is then connected by a light belt with sewing machines, fans, egg beaters, coffee mills, ice cream freezers, churns, or with lathes, dental engines, scroll saws, washing machines, printing presses, etc. It is made in two sizes, No. 1, with a 5½ inch wheel, for light work, and No. 2, with a 15 inch wheel, for heavy work. It is offered at a low cost, is not liable to get out of order, and invariably causes surprise, when first used, by the amount of work of various kinds it performs. It is made by the Bolgiano Water Motor Co., Peabody Fire Insurance building, room 25, Baltimore, Md.

Instrument for Testing Hardness.

In Dingler's *Polytechnisches Journal* there was recently described a new form of apparatus in use at the Royal Research Laboratory, Berlin, for testing the comparative hardness of different materials. The substance to be tested is prepared with a smooth or polished face, and scratched with a diamond. This diamond has a point as nearly as possible conical, with an angle of 90 degrees, and is drawn over the substance to be tested under a constant pressure. The hardness is then estimated by the width of the scratch made, which is measured by a micrometer. The following comparative results were obtained, and are expressed in arbitrary units, which are inversely proportional to the measured breadths of the lines: Lead, 168; tin, 234; copper, 398; zinc, 426; nickel, 557; soft steel, 765; glass, 1,355; hard steel, 1,375.

AN IMPROVED COMMUTATOR BRUSH.

In the brush for dynamos and motors shown in section in the accompanying illustration the contact of the brush with the commutator cylinder is a rolling instead of a sliding one. The improvement has been patented by Mr. Frederick H. Sandherr, of No. 2618 St. Louis Avenue, St. Louis, Mo. The commutator

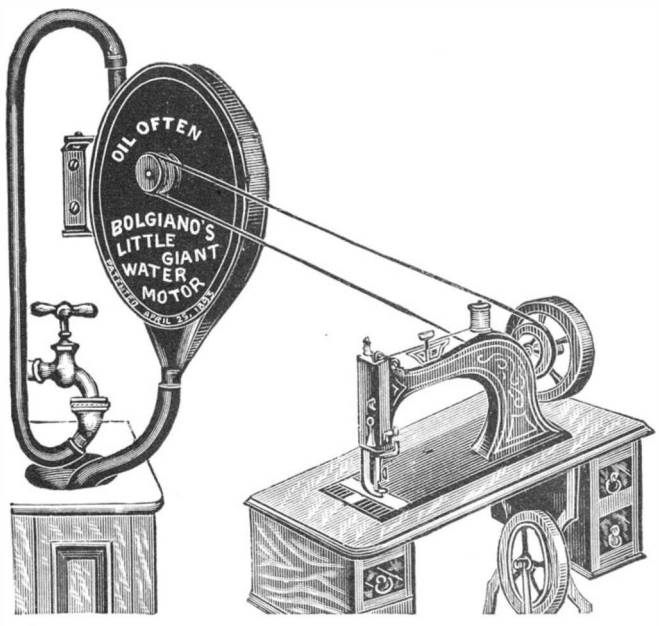


SANDHERR'S BRUSH FOR DYNAMOS, ETC.

cylinder carried by the armature shaft is of ordinary construction, and the brush arm is pivoted on the journal box of the armature shaft as usual. A longitudinal stud inserted in the brush arm, and insulated therefrom, has a longitudinal groove, and the outer end of the stud is supported in a split insulating thimble by an arm projecting from the brush arm. Upon the stud are shown three collecting wheels, though a greater or less number may be used, the boss of each wheel having a feather which fits in the groove of the stud, the boss also having an integral collar and a shoulder supporting a loose collar, while a ring between the collars has an attached spring, the arrangement being such that a collecting wheel running on the ring will accommodate itself to the inequalities of the commutator cylinder. The outer portion of the wheel consists of a tread and web, the latter bored out and provided with a steel lining, between which and the ring are placed hardened steel rollers. In the collars are capsules, each containing a contact piece pressed forward by a spiral spring. The boss and attached collars being stationary, and the movable portions of the collector being in good electrical contact with the contact pieces, the current collected by the movable part of the brush is conveyed to the stud, to be taken therefrom in the same manner as from the brush-holding studs of sliding brushes.

Success of the New Cunard Steamer Lucania.

The Cunard steamer Lucania made one of the most remarkable first voyages ever made across the Atlantic, and lowered the maiden record by seventeen hours. Her time on this first trip was 5 days 15 hours and 37 minutes. Her captain stated that the coal was poor,



BOLGIANO'S "LITTLE GIANT" WATER MOTOR.

owing to the strikes at the Liverpool coal docks. The distance traveled by the Lucania was 2,781 miles, and by the Paris on her record trip 2,782. The Lucania has since lowered the western record by fifty-nine minutes on her second westward trip, which ended at Sandy Hook bar October 6. The time of this second trip was 5 days 13 hours and 25 minutes. The best time ever made by the Paris was 5 days 14 hours 24 minutes.

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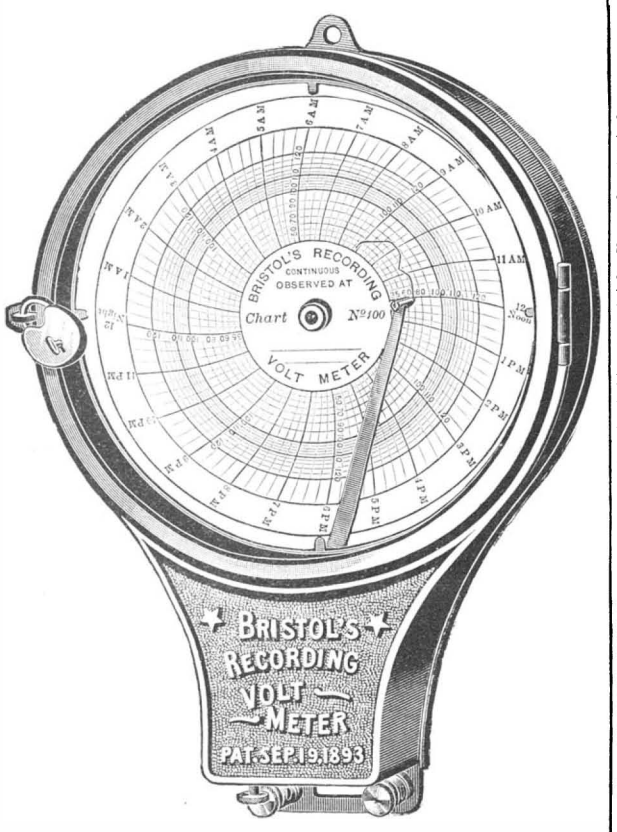
RECORDING INSTRUMENTS AT THE WORLD'S FAIR.

One of the attractive exhibits in Machinery Hall, section 25, is that made by the Bristols' Mfg. Co., of Waterbury, Conn., as shown in our illustration. Since its establishment in 1889, this company has developed an extensive business with Bristol's recording pressure gauges and steel belt lacing. Their line of gauges is now one of the most complete ever produced, comprising a list of over twenty different ranges, from vacuum to fifteen hundred pounds per



RECORDING VOLTMETER.—Fig. 1.

square inch, and adapted to record continuously, day and night, pressures of air, gas, steam, water and liquids.

The corner space occupied by the exhibit is diagonally spanned by an excellent imitation of a stone arch, the facing of fine leather, and the stones fastened together with the company's patent steel belt lacing. To each of the stones is attached one of their gold-plated recording gauges, every alternate instrument being provided with an electric light. On one pillar supporting the arch is a gauge in operation recording the pressure of steam used in the building. On the other pillar of the arch is one of their new recording voltmeters in operation recording continuously the voltage of the alternating current which supplies the lights. An artistic and ornamental feature is the semicircular grille of wrought iron, which fills in the arch and bears the name of the company and their specialties. Models of the different recording instruments are arranged on tables, so that visitors may examine the construction. For the high pressures a hand screw pump is provided, but for low pressures a gauge is fitted with a mouth piece, and each visitor can operate the model by blowing. A new recording thermometer is also shown in operation, but it will not be placed upon the market until their recording pyrometer is ready. A complete line of their patent steel belt lacing for all kinds of belting is also attractively displayed. Outside of their exhibit, there are eight of Bristol's recording gauges in operation at different points within the Fair grounds.

As the new recording voltmeter for alternating or direct currents has not been previously described, we illustrate the instrument, Fig. 1 showing it complete ready for connection, and Fig. 2 with front case removed, from which the extremely simple construction and manner of operation will be readily understood. The coil, A, is mounted on the spring knife edge supports, D and E, and free to move toward the parallel and stationary coil, B, when they are mutually attracted to each other by a current passing in series. The current is conducted to the movable coil, A, through the supporting springs, D and E, and this, together with the special feature of the moving coil being mounted on frictionless spring knife edges, renders the instrument extremely sensitive to the smallest changes of voltage. The marking arm, F, is attached directly to the spring, E, and partakes of its motion, recording the changes of voltage on a uniformly revolving chart. It will be observed that the instrument is constructed on the electric balance principle without permanent magnets. The divisions on the chart are on an increased scale in the vicinity of the voltage to be maintained, thereby making it possible to note the variation of one volt. The chart shown, Fig. 1, is intended for a one hundred and ten volt circuit. The coil, C, is an auxiliary resistance. With the alternating current voltmeter the auxiliary resistance is furnished in a separate rheostat which may be adjusted to suit the rate of alternations of the current to be measured. Several of the instruments have been in use in large electric light stations for the past three months, and are giving the highest satisfaction. One of the voltmeters is on exhibition in Electricity building. Two of them, one alternator and one direct current, are being used by the Committee on Awards in connection with the life tests of incandescent lamps.

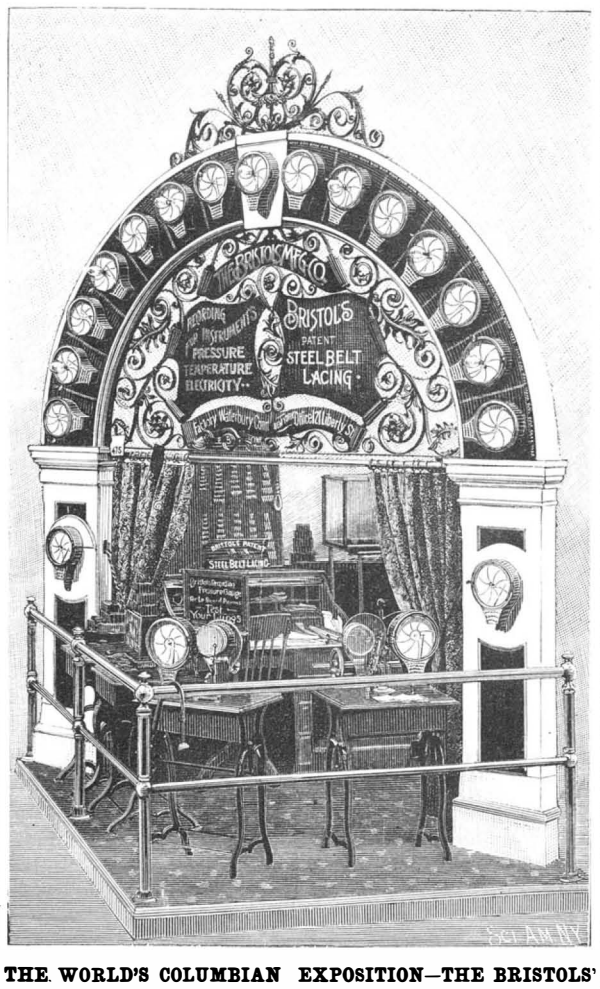
The Action of the Eye.*

NIKOLA TESLA.

It can be taken as a fact, which the theory of the action of the eye implies, that for each external impression, that is, for each image produced on the retina, the ends of the visual nerves concerned in the conveyance of the impression to the mind must be under a peculiar stress or in a vibratory state. It now does not seem improbable that, when by the power of thought an image is evoked, a distant reflex action, no matter how weak, is exerted upon certain ends of the visual nerves, and, therefore, upon the retina. Will it ever be within human power to analyze the condition of the retina when disturbed by thought or reflex action, by the help of some optical or other means of such sensitiveness that a clear idea of its state might be gained at any time? If this were possible, then the problem of reading one's thoughts with precision, like the characters of an open book, might be much easier to solve than many problems belonging to the domain of positive physical science, in the solution of which many if not the majority of scientific men implicitly believe. Helmholtz has shown that the fundi of the eyes are themselves luminous, and he was able to *see*, in total darkness, the movement of his arm by the light of his own eyes. This is one of the most remarkable experiments recorded in the history of science, and probably only a few men could satisfactorily repeat it, for it is very likely that the luminosity of the eyes is associated with uncommon activity of the brain and great imaginative power. It is fluorescence of brain action, as it were.

Another fact having a bearing on this subject which has probably been noted by many, since it is stated in popular expressions, but which I cannot recollect to have found chronicled as a positive result of observation, is that at times, when a sudden idea or image presents itself to the intellect, there is a distinct and sometimes painful sensation of luminosity produced in the eye, observable even in broad daylight.

Two facts about the eye must forcibly impress the mind of the physicist, notwithstanding he may think or say that it is an imperfect optical instrument, for-

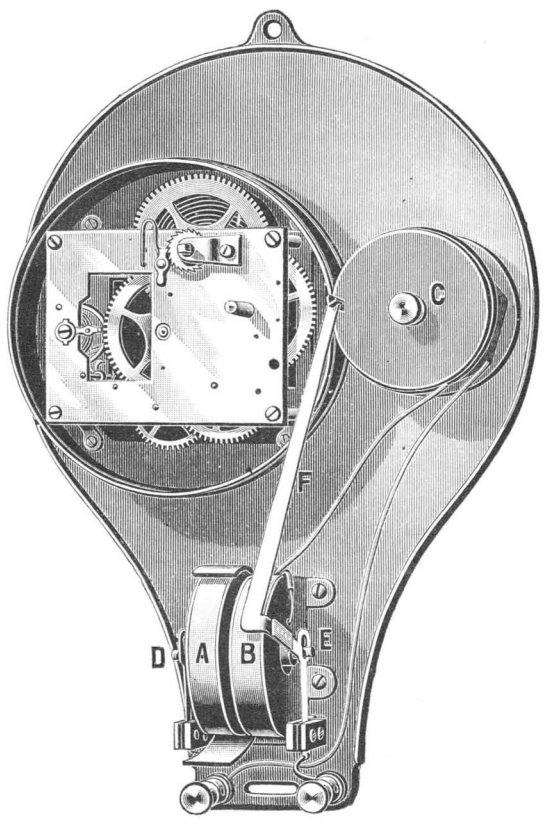


THE WORLD'S COLUMBIAN EXPOSITION—THE BRISTOLS' MANUFACTURING COMPANY'S EXHIBIT OF RECORDING INSTRUMENTS.

getting that the very conception of that which is perfect, or seems so to him, has been gained through this same instrument. First, the eye is, as far as our positive knowledge goes, the only organ which is *directly* affected by that subtile medium which, as science teaches us, must fill all space; secondly, it is the most sensitive of our organs, incomparably more sensitive to external impressions than any other.

This divine organ of sight, this indispensable instrument for thought and all intellectual enjoyment, which lays open to us the marvels of this universe, through which we have acquired what knowledge we possess, and which prompts us to and controls all our physical and mental activity—by what is it affected? By light! What is light?

It is beyond the scope of my lecture to dwell upon



RECORDING VOLTMETER.—Fig. 2.

the subject of light in general, my object being merely to bring presently to your notice a certain class of light effects and a number of phenomena observed in pursuing the study of these effects. But to be consistent in my remarks it is necessary to state that according to the idea now accepted by the majority of scientific men as a positive result of theoretical and experimental investigation, the various forms of manifestation of energy which were generally designated as "electric," or more precisely "electro-magnetic," are energy manifestations of the same nature as those of radiant heat and light. Therefore the phenomena of light and heat, and others besides these, may be called electrical phenomena. Thus electrical science has become the mother science of all, and its study has become all-important. The day when we shall know exactly what "electricity" is, will chronicle an event probably greater and more important than any other recorded in the history of the human race.

* Extract from paper on the "Action of the Eye," read before Franklin Institute.

Whitewashing by Machine.

A correspondent in York, Pa., calls our attention to a plan for whitewashing successfully followed there in imitation of a method of painting employed on the buildings of the World's Columbian Exposition, devised by Mr. F. D. Millet, director of decoration, and illustrated in the SCIENTIFIC AMERICAN of April 29, 1893. A building 50 × 150 ft., two stories high, was to be whitewashed, and the lowest estimate of cost obtainable was $85, while by the method adopted the expense was reduced to $25 or $30. The whitewash was slaked and carefully strained through a fine sieve into a barrel to which was attached the suction pipe of a small double-acting force pump. The pump and supply of whitewash were placed in a convenient location on the first floor, with a delivery pipe, to which was attached fifty feet of hose to be taken to any part of the building. A pressure of 100 pounds per square inch was pumped into the delivery pipe and the whitewash discharged through a nozzle having a hole one-sixteenth of an inch in diameter. The arrangement did the business in first class style, and made a better job than could be made with a brush. No ladders were required; the man in charge of the hose standing on the floor can cover every spot of the roof timbers, twenty-five feet above his head.

Bread Made with Soap.

From a communication read to the Association of Belgian Chemists, it seems that Continental bakers are in the habit of mixing soap with their dough to make their bread and pastry nice and light. The quantity of soap used varies greatly. In fancy articles, like waffles and fritters, it is much larger than in bread. The soap is dissolved in a little water; to this is added some oil, and the mixture, after being well whipped, is added to the flour. The crumb of the bread manufactured by this process is said to be lighter and more spongy than that made in the ordinary way.

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Notes from the World's Columbian Exposition.

(*Continued from page 243.*)

Canada makes a splendid display in the Manufactures and Liberal Arts building, and it is evident from the variety of manufactured products that the Dominion has made great strides in fostering home industries. The great feature of this exhibit is the display made by the Indian schools of Manitoba and the Northwest. A number of Indian girls and boys from these schools are seen practicing different trades and kinds of work. One girl will be knitting, another crocheting, others doing fancy needle work and embroidery, while still others spin yarn on an old-fashioned spinning wheel, weave rag carpeting on a hand loom, and do other work. The boys are setting type, operating a hand printing press, and otherwise demonstrating their skill. A great many samples of work done by these young Indians are exhibited. Some excellent carpentry and iron products show the practical training that the boys receive. A wigwam, such as these Indians in their native condition inhabit, adds special interest and contrast to this exhibit. It is covered with buckskin, and in connection with it there are shown household utensils and native-made hunting and fishing apparatus. There is a fine display of robes, such as are used in the extreme Northwest, made of different materials, such as loon skins, lynx paws, deer skin, muskrat, and there are several robes made of Arctic rabbit skins. The skin of the rabbit is tender, and in order to give these robes strength, the skin is cut into strips and twisted, and the twists woven, leaving coarse meshes, yet making a very warm robe. This sort of a robe is used very extensively all through British America, from Manitoba even as far north as the mouth of the Mackenzie River, and is also found in use among the Esquimaux of Alaska. They are almost as light as down and have equal warmth.

Idaho's mining interests are extensive, as shown by the size of its exhibit in the Mining building, where several large piles of ores, mostly gold, silver, and silver-lead ores, are displayed, but also specimens of copper and lead and a few valuable stones such as opals and rubies. The Utah exhibit also consists chiefly of gold, silver, and silver-lead ores, together with considerable base bullion. There is also shown here coal, onyx, rock salt, rubies, opals, asbestos, potash, sulphur and concentrates, also iron ores. The feature of the Montana mining exhibit is the silver statue which occupies the most commanding position of the section. The rest of the section is given up almost wholly to large displays of silver ores. There are cases of beautiful specimens of native silver and silver crystals, also a case of gold crystals and nuggets of gold from the placer mines and fine displays of sapphires, tin and bismuth, copper ores and ingots and manufactures of copper. Colorado's space is large and is almost walled in by massive specimens of silver and silver-lead ores. Gold ores in various forms, petroleum, marble, building stones, and coal, both anthracite and bituminous, are also exhibited. In the center of the space are several cases containing specimens of placer gold, free gold and gold crystals. Surrounding this are shafts of building stone arranged in a circle, and on top of each shaft is a rich specimen of silver ore. The silver interests of this State are very completely represented, as are also the iron interests.

The railway terminal facilities at the Exposition were constructed on a far larger scale than has been necessary, but they have proved highly useful in handling the crowds.

The stub system of tracks is used, with facilities for locomotives to run around to the other end of the train. Four tracks enter the grounds at the south end and spread out, continually enlarging, until they aggregate thirty-three tracks in the station. The Terminal Station itself is a beautiful structure of staff and is a model railway station.

The switching of trains is done by means of an interlocking system, which is operated on the combined steam and hydraulic plan. One tower at the entrance to the grounds has control over the outer yard, while the switching immediately connected with the tracks in the inner yard and the Terminal Station proper is controlled from another tower located convenient to where the tracks spread out. The Illinois Central, the Baltimore and Ohio, the Northern Pacific and other railroads run trains at regular intervals into this station.

The location of this station is most fortunate, as visitors arriving in trains here pass through or around the building and are in the very heart of the grounds, the open plaza surrounding the Administration building, and are ushered at once into the center of the most inspiring part of the Exposition.

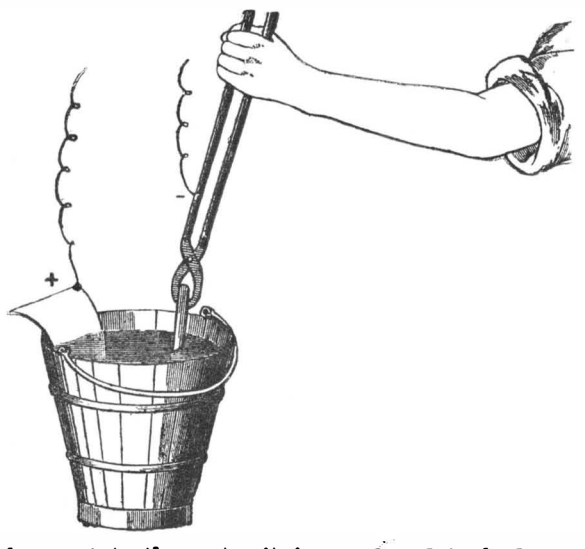
A writer in *Scribner's Magazine* says: "Night and electric light play a great part in the spectacular side of the Fair. Solomon in all his glory never saw such a sight as the plain people of this continent have had on illumination nights this summer. Innumerable incandescent lights sparkle along the cornices and pediments; the top of the wall inclosing the grand basin is outlined in fire; search lights from the top of the Liberal Arts building cut their wide swaths of light in gigantic circles, resting for a moment here and there to bring out now this detail or to throw into dazzling relief a sculptured figure or beast. It lingers longest on the MacMonnies fountain, the fitting jewel resting lightly on the bosom of this Venetian beauty whom but yesterday we called Chicago; and well it may, as in a degree the fountain is the *clou* of the Exposition."

The new heating process of Lagrange & Hoho, of Brussels, Belgium, is shown working at the Exposition. It is a very curious process, says the *Electrical Review*, and seems quite incomprehensible at first sight. In this process a rod of iron is raised to a white heat in a pail of water.

The experiment was made as shown below. An ordinary wooden pail is three-quarters filled with water slightly acidulated, a lead plate about 9 inches broad by 16 inches long dips to the bottom of the pail and is connected to the + pole of 110 volts incandescent dynamo machine capable of giving over 150 amperes. The iron rod, or article to be heated, is connected to the — pole of the dynamo, and simply dipped into the water; it immediately becomes heated and rapidly rises to a melting temperature, only that portion of the metal completely immersed becomes heated, and the heating is so rapid that neither the water nor that portion of the metal out of the water becomes very warm.

Wrought iron and steel actually melt if long enough held under the water. A carbon rod subjected to this process becomes amorphous carbon, proving that a temperature of at least 4,000° Centigrade has been reached, and it is stated that with 220 volts pressure a temperature of 8,000° Centigrade has been reached.

There are various theories to account for this phenomenon; but from close observation, it appears to be a case of arc heating. The moment the metal is



plunged into the water it is enveloped in hydrogen gas decomposed from the water. This envelope of gas parts the water and metal, forming an arc, which raises the surrounding gaseous envelope to an enormous temperature; the metal surrounded by this arc is almost immediately raised to the same temperature. A flame of burning hydrogen appears round the metal on the surface of the water.

The principle of the method is the same as that on which the burning of an arc light between two carbon points under water depends. An arc lamp will burn quite steadily under water if the connections are made waterproof; the arc itself requires no protection.

The Patent Congress at Chicago.

In addition to the interesting proceedings noticed in our article on page 242, a paper from the pen of Miss Helen Blackburn, of London, England, was read. This was a historical sketch of the inventions of English women and the patents issued to them by the British government. She said the first patent ever issued was granted in 1617, and twenty years later the first patent was granted to a woman, which was for a preparation of tincture of roses, saffron, etc. It was granted to Amy Everard, and a year later the second patent right was granted to Sara Gerome, who patented the engine for cutting wood into thin pieces for use in making band boxes and sword sheaths. The number of patents taken out by women is increasing rapidly year by year, marking the steps of education, civilization, wealth and luxury. She said that the rapid increase in woman's patents is clear evidence that in the past it had been opportunity rather than faculty that was lacking to place her among the inventors.

Ex-Secretary Noble delivered a very interesting address. He said the remarkable era of discovery and invention now unfolding its marvels and glories was due chiefly to the benign features of the United States government and the spirit of its patent laws. There had been at all times a remarkable union of scientific discovery with advance toward freedom. He spoke of the influence of inventions upon the forms of government and the advancement they made, claiming that they were largely the results of patriotic spirit. In this connection he referred to the large number of beneficial inventions and patents produced during the civil war, declaring that they were the means by which the government was enabled to successfully maintain its army and prosecute the war with the great producing fields of the West and Northwest depleted of men, but supplied with machinery to do the work of the farms.

"Imagine the war of secession," he said, "to have occurred with no railroads, no telegraphs, no improved arms, no Hoe printing presses, and without its most remarkable attachment — the reporters. It would doubtless be going on yet in swamp and mountain, with flint lock and solid shot and a wooden fleet. Where would have been the possibility of this Fair but for the inventions, not of the last 400 years, but of the last century, and even of the last half of the last century?"

General William F. Draper read an address on the "Influence of Inventions on the Cotton Industry," showing how the machinery for gathering and preparing the crop for market and the improvements for its manufacture have been instrumental in making this the greatest cotton-producing country in the world.

Remedy for Toadstool Poisoning.

Captain McIlvaine's recommendation when by mischance any of the poisonous toadstools have been eaten, published by him in the *Therapeutic Gazette*, is as follows: "The physician called upon to treat a case of toadstool poisoning need not wait to query after the variety eaten, he need not wish to see a sample. His first endeavor should be to ascertain the exact time elapsing between the eating of the toadstool and the first feeling of discomfort. If this time is within four or five hours, one of the minor poisons is at work, and rapid relief will be given by the administration of an emetic followed by one or two moderate doses of sweet oil and whisky in equal parts. Vinegar is effective as a substitute for oil. If from eight to twelve hours have elapsed, the physician may rest assured that amanitine is present, and should administer one-sixtieth of a grain of atropine at once."

The atropine should be subcutaneously injected, and the injection repeated every half hour until one-twentieth of a grain has been given or the patient's life has been saved.

Richard A. Proctor.

Richard Anthony Proctor, the astronomer and scientist, died of yellow fever in the Willard Parker Hospital, New York City, on the evening of September 12, 1888, having contracted the disease in Florida. The body was embalmed and sealed in a metallic casket and buried in the family lot of the Rev. Stephen Merritt at Greenwood Cemetery, Brooklyn. His grave remained neglected until a newspaper urged the erection of some fitting memorial. The paragraph came under the notice of George W. Childs, the Philadelphia philanthropist, of the *Public Ledger*. He at once responded to the call and provided an excellent lot in the beautiful Greenwood Cemetery and also ordered a fitting monument of Quincy granite as a proper tribute to the memory of the revered astronomer. The services connected with the re-interment took place on Wednesday, October 4, and were attended by Miss Mary Proctor, eldest daughter of the late R. A. Proctor; Prof. E. Ogden Doremus, Thomas A. Edison, Simon Newcomb, Prof. C. A. Young, Prof. Lewis Swift, and others, as well as the Rev. T. De Witt Talmage, who delivered the eulogy.

The monument is 8 feet high and 5 feet wide. The inscription on the front is as follows:

RICHARD A. PROCTOR,
Astronomer.
Born Chelsea, England,
March 23, 1837.
Died in New York City,
September 12, 1888.
Aged 51 years.
"How good! how kind! and he is gone!"
ERECTED BY GEORGE W. CHILDS.

Upon a polished panel on the reverse side appears the epitaph letter written by Herbert Spencer, the life-long friend of Proctor. The inscription reads as follows:

On public as on private grounds, Prof. Proctor's premature death was much to be lamented. He united great detailed knowledge with broad general views in an unusual degree, and, while admirably fitted for a popular expositor, was at the same time well equipped for original investigation, which, had he lived, would have added to our astronomical knowledge. Prof. Proctor was also to be admired for his endeavors to keep the pursuit of science free from the corrupting and paralyzing influence of State aid.

"HERBERT SPENCER."
1893.

Mr. Proctor did more, perhaps, to popularize the study of astronomy, both as an essayist and lecturer, than any other man. The present monument is a touching tribute to his memory.

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BENJAMIN JOWETT.

The Rev. Benjamin Jowett, Master of Baliol College, Oxford, died suddenly on Sunday, October 1. Dr. Jowett was born at Camberwell, near London, in 1817. He was a distinguished graduate of Baliol College, and was successively a Fellow, Tutor, and at last, in 1870, Master of the college, which position he retained until his death. In 1882 he was appointed vice-chancellor of Oxford University for the term of four years.

BENJAMIN JOWETT.

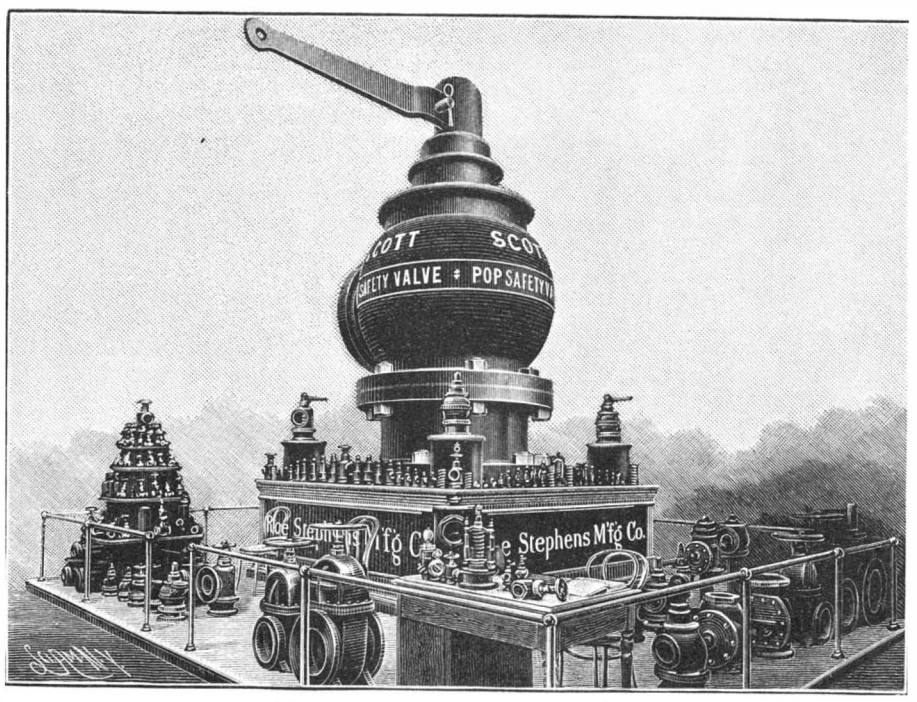
Dr. Jowett is principally known by his works on Greek and by his masterly translations. Probably the best known of Dr. Jowett's works is his translation of Plato's Dialogues, published in 1871, including "The Republic." He received many honors, including the degree of LL.D. from the University of Leyden, and many other degrees from the great universities. In the death of Dr. Jowett the world has lost a great scholar and Oxford one of the best and most broad-minded of educators. For our portrait we are indebted to the *Outlook*.

A Wonderful Lighthouse.

The lighthouse board has been informed that a lighthouse is to be erected on Penmarch Point, Brittany. It will contain a "lightning flash" light of 40,000,000 candle power, casting a beam which can be seen in clear weather sixty-three miles away and in foggy weather twenty-one miles. This is by far the most powerful, searching and penetrating light known to science. It will cost about $60,000, and be known as the Eckmuhl lighthouse.

STEAM VALVES, ETC., AT THE FAIR.

An interesting exhibit in Machinery Hall in the way of specialties in steam valves, etc., is that of the Roe Stephens Manufacturing Company, of Detroit, Mich. Among the leading articles in their display is Scott's patent improved straight-way valve, a first-class valve throughout, superior in workmanship and quality of metal. By the peculiar construction of the patent cylindrical wedge and the full circular bearing upon the back of the disk or gate the wear is taken from the face and seat, thus insuring a perfect seating and the impossibility of the disks springing, bending, or getting out of shape. The Scott bevel seat check valve and globe and angle valves with Scott disks are also shown. The Goldsmith throttle and main stop valves, etc., made solely by this company, are quick and easy opening and closing, and the valves and seats are so constructed that uneven wear is prevented, and all parts can be taken from the body and replaced without breaking pipe connections. The Rouse swing check valve has an adjustable valve seat that can be taken out and reground, and the valve is balanced to work like a poppet valve. The Michigan automatic injector, the Crescent ejector, and union elbows for hot water heaters are other specialties shown. The Orme pop safety valve and the Orme water relief valve, of which the company are the sole manufacturers, as well as the Scott pop safety valve and Scott water relief valve, have all received the indorsement of the government Board of Supervising Inspectors of Engineers. The exhibit displays the several specialties to excellent advantage.



THE WORLD'S COLUMBIAN EXPOSITION—EXHIBIT OF THE ROE STEPHENS MANUFACTURING COMPANY.

A Foreigner's Impression of America.

Mr. Walter Besant, the English novelist, has been traveling in this country, and in an interview with a representative of the *Pall Mall Budget* he relates his impressions of the people and some of the cities he visited. We copy in part:

"What do you think of Chicago?"

"The business part of the city is ugly. It consists of vast blocks of buildings. Three of these blocks—they are contiguous, and each is eighteen stories high—accommodate no fewer than 9,000 people—principals, clerks, storekeepers, warehousemen, and others—every day. This part of the town is empty in the evening and is silent on Sunday; it is, in point of fact, very similar to our own 'City.' Outside the region of business there are beautiful villas forming suburbs like those which encompass London."

"And the inhabitants of this great city—what of them?"

"There is one great point to note in these towns," said Mr. Besant, by way of reply, "and that is the vast number of foreigners. In Buffalo, for example, there are a Polish quarter, a German quarter, an Irish quarter, and a native American quarter."

"But the English—have they no quarter?"

"They generally merge with the Americans. The Irish do not. They keep to themselves and form their own little political caucuses; but it would be an exaggeration to say that they are greatly beloved by the people in whose midst they have condescended to take up their abode. Some day, indeed, the Americans will rise and—but, there, we had better not talk politics."

"And the other races—the Poles, the Germans, and the like?"

"These will merge, like the English, with the Americans. And that very soon, I think. Listen to this little anecdote. While in New Haven, I was asked one day if I would have my boots 'shined.' It was a bright-faced pretty little fellow who accosted me. I asked him his name, and he said that it was Bobolovoski, or something of the sort—spell it in your own way—and that he was a Polish Jew. He was only ten years of age, he said, and he got up every morning at six and went out to 'shine.' From nine to twelve he was at school. He 'shined' from twelve until the afternoon, when he went to school again, and in the evening he 'shined' once more. Now this little fellow was, in fact, a perfect American—there can be no question about it—although by birth he was a Polish Jew."

"And now, Mr. Besant, I should like a few of your impressions of America."

"I have not overmuch to say," the novelist replied. "The thing which struck me most was the fact that you have not seen America at all until you have been to Chicago. New York is not America, New York is a cosmopolitan city; Boston is not America, Boston is old; Philadelphia is not America, Philadelphia is asleep. But at Chicago you are in the very heart of the country—you are at the center of everything. Chicago will be to America what Babylon formerly was to Asia. The city and its inhabitants are young. They are rich in resource. They are full of confidence. They do not care what they spend. Consider what sums they have laid out over the Exhibition. 'We do not mind,' that is what they seemed to say, 'let the thing be a dead failure if it will; we can get plenty more millions later on.' These good people do not want to save, and they have no desire to endow a family. They give away enormous sums. During 'Commencement' at Harvard University, the president announced the receipt of donations amounting to something like $750,000. Harvard is, indeed, richer than Cambridge. Yes," said Mr. Besant in conclusion, "America, in spite of the many years that have rolled by since she first became a nation, is still young—young, vigorous, and rich in hope for the future."

PROFESSOR HELMHOLTZ.

Professor Hermann Ludwig Ferdinand von Helmholtz, the distinguished German scientist, is now on his way home after visiting the Columbian Exposition and the Electrical Congress. Professor and Mrs. Helmholtz have been well received both in Chicago and New York, where receptions were tendered them in Columbia College and by the Century Club. Dr. Helmholtz delivered an interesting lecture at the College of Physicians and Surgeons, New York, October 3,

HERMANN VON HELMHOLTZ.

in which he described the ophthalmoscope, the story of its invention and how it was suggested and induced. This lecture was warmly applauded and was attended by many scientists, including Alexander Graham Bell, Seth Low, etc.

Dr. Helmholtz was born August 31, 1821, at Potsdam, Germany. He studied medicine and early in life made many discoveries in microscopy and fermentation. His discoveries and writings show that he has a deep insight in nearly all branches of science. In the year 1851 Helmholtz astounded the scientific world by the discovery and description of the ophthalmoscope, for examining the retina in the living eye. This invention, which is one of the crowning achievements of medical science in the nineteenth century, has saved the eyesight of thousands. The science of physiological optics owes a deep debt of gratitude to Helmholtz for his researches, which are of inestimable value. Appointed professor of physiology in the University of Heidelberg, he brought out his important book, "Doctrine of Tone Sensations as a Physiological Basis of the Theory of Music." In 1871 he was given the chair of physics in the University of Berlin, where he devoted much time to researches on electricity. Professor Helmholtz was invited in 1887 to preside over the physico-technical institution in Berlin founded chiefly by Dr. Werner Siemens. Professor Helmholtz accepted the call, but still retains the position of professor ordinarius in the university. In 1883 the German Emperor conferred on Herr Helmholtz and his family the honor of hereditary nobility.

An extended notice of the life and scientific services of Dr. Von Helmholtz will be found in the SCIENTIFIC AMERICAN SUPPLEMENT of October 10, 1891.

Lighting of the Broadway Cable Cars.

The gas used in lighting these cars, as well as all cars using the Pintsch system, is made from crude petroleum, by the Pintsch system, from which a very rich gas of over 70 candle power is obtained, and which will stand a very high degree of compression without materially affecting its illuminating qualities. Coal gas, on the other hand, will not stand high compression, as it is a low candle power gas, and loses 50 per cent under compression, whereas oil gas loses only about 10 per cent. The plant which supplies the gas for the Broadway cars is located at the works of the Consolidated Gas Company, at 42d Street and Eleventh Avenue.

THE ordinary folding fan is supposed to have been invented in Japan, in the seventh century, by a native artist, who derived the idea from the way in which the bat closes its wings.

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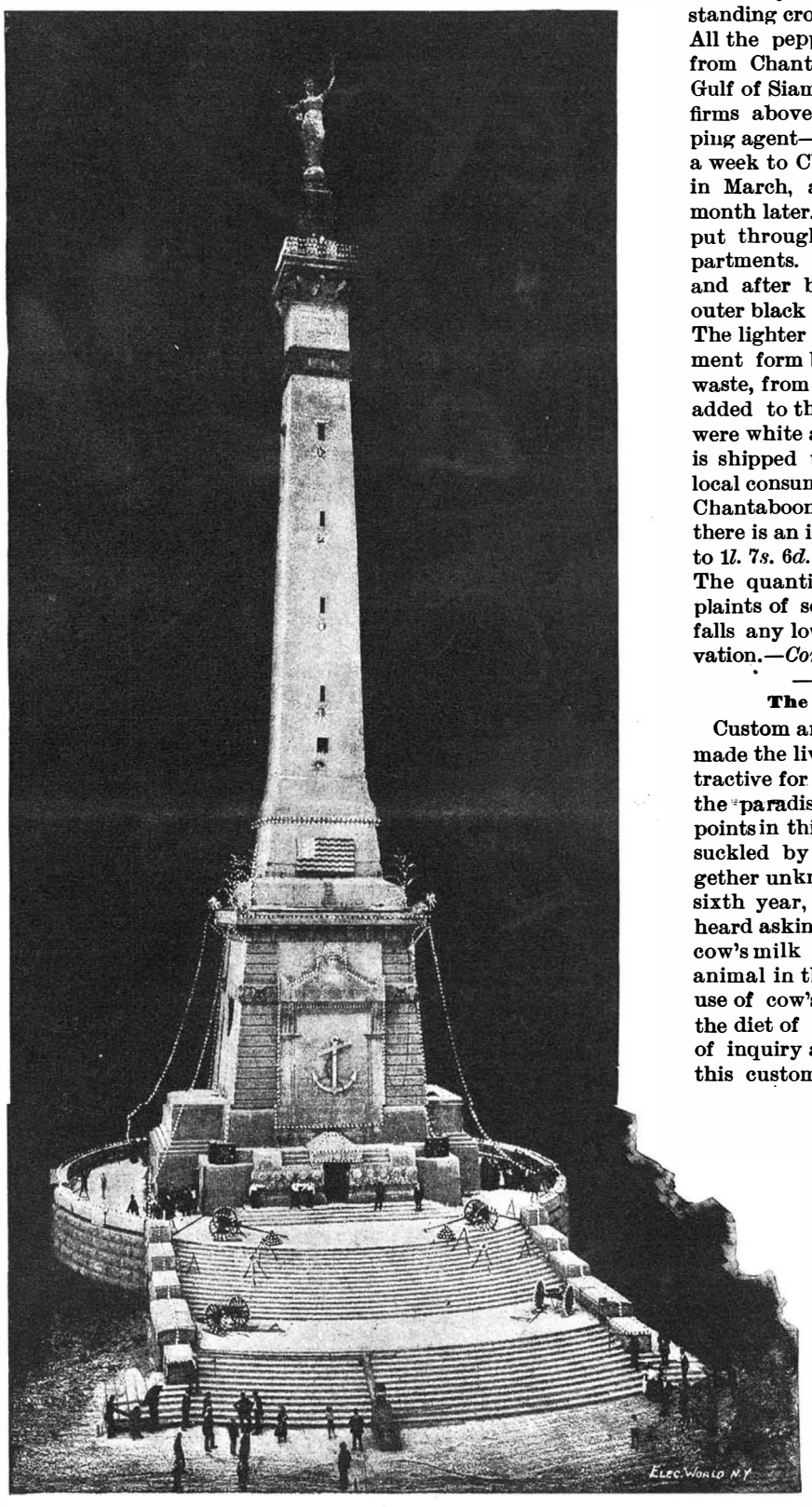
ELECTRICAL ILLUMINATION OF A MONUMENT.

The illumination of the Soldiers' and Sailors' Monument at Indianapolis, on the occasion of the recent national encampment of the Grand Army of the Republic at that place, as shown in our illustration, was a practical triumph for the electricians, who designed for the purpose decorations of surpassing beauty, which excited general admiration. Around the balustrade at the top of the shaft a triple corona of light was cast down upon its column and up toward the statue crowning the top. Back of the first astragal windows were placed electric reflectors, throwing into bold relief the dates. Down toward the earth a girdle of lamps encircled the monument and served as an introduction to the display below, where the navy astragal was placed. In the center of the panel on the south side an immense American flag outlined in lamps of appropriate colors seemed to wave as though floating in the wind. As a background to the four lion heads rose four sprays of lights of various colors, and below the heads ran a second belt of lamps. The corners of the pedestal were outlined in lamps, as also the borders of the large panel on the south side. The most attractive display on this side was a huge anchor, typical of the navy, outlined in pure white lamps. Over the corner head at the top of the panel a delicate wreath of miniature lamps cast a soft glow on the laurel leaves below. The panels on the east and west side each supported a large American shield, also outlined in light, while on the northern panel was suspended a monster wreath of laurel, with myriads of lights glowing here and there through the foliage. At the base of the main pedestal were placed light electric wheels, two at each corner, bearing on their faces various artistic designs in lamps, which changed color and arrangement as the wheels revolved. The main doorway of the monument was outlined in light. On the upper landing were placed two pyramids of cannon balls, each ball lighted by a miniature lamp. On the steps leading down from this landing were four stacks of muskets, each with a wreath of various colored lamps thrown gracefully over the bayonets. On the second landing were two field pieces, with their outlines depicted in light. The balustrades of the terraces were also outlined in light, the lamps following the architectural details. To add to these effects, four large search lights of 20,000 candle power each concentrated their rays upon the statue.

Over 500 lamps were used in these decorations, varying in candle power from one to sixteen. The difficulty of placing the lamps was very great. All the display pieces had to be suspended by fine wires from the windows of the shaft, and a large portion of the work had to be done by men suspended in swings, often 70 feet from the ground. The switchboard which controlled the lighting of the whole monument was situated in the corridor. For our illustration and particulars we are indebted to the *Electrical World*.



MONUMENT AT INDIANAPOLIS ILLUMINATED BY ELECTRICITY.

The Mississippi Willow.

People who are unfamiliar with the Mississippi River are tempted to wonder when they first see it why so many thousands of acres of willows grow along its borders and islands and what they are good for. The United States government, it is safe to say, would not be half as far along with the improvement of the Mississippi as it is if it had not had the humble and seemingly useless willow. It is of no account for building, it cannot be construed as firewood by any but the most active imagination, and it is of no use in the arts, beyond the making of whistles, but when it comes to building a dam the engineers find nothing that fills the bill half as well as the humble willow. It lines the shores and can be easily reached from the barges whereon it is transported, and it is so soft that it is easily cut and handled. It is woven into a great, long, continuous mat. One end of this is anchored to the shore on one side of the chute that is to be dammed, and the process of weaving is thence carried on straight across the stretch of water on a peculiarly shaped boat called a grasshopper. As fast as the mat is woven on the grasshopper it slides into the water at the lower end of the inclined weaving rack, and it is laden with rocks and carried straight to the bottom, and this is continued till the opposite shore is reached. The mat is then covered to the proper depth, 12 to 15 inches, with rock, and then another mat, made in the same way, is woven and laid down on top of the first, and similarly weighted down, and this work is continued till the dam has risen as high as it is intended to stand; the finishing being always a heavy coating of rock that covers the willow and all. The willow, always covered with water and the mud that inevitably lodges among the rocks of the dam, is kept sealed air-tight, and of course does not decay. It binds the rocks together and prevents the dam being shoved out of place by ice or disturbed by the pressure of the current at high water. It is good for no other purpose save to hold a shore that is washing away with its roots, and for dam construction it is superlatively the thing.—*Davenport (Iowa) Democrat.*

A Novelty in Electric Railway Franchises.

The city of New Orleans, so *The Electrical Engineer* says, has just sold for $700,000 cash down, to the New Orleans City and Lake Railroad Company, a renewal from 1906 until 1956 of that company's extensive street railway franchises. This is certainly a novelty in the granting of franchises, so long before they begin, but the company wanted to be sure of its protection before making a proposed heavy investment in electric traction, and apparently did not consider $700,000 too much. The company has thus given itself a lease not short of 63 years from the present time, and can go ahead with its electrical work, in the consciousness that it is safe from interruption or competition during all that period. The public and the local papers seem well pleased with the bargain driven, and speaking in the interests of electric traction, we see nothing to find fault with. The sum really amounts to $1,246,000, with interest counted in, and that is a pretty handsome figure for the franchise, even in such a city as New Orleans. The electrical system will be installed forthwith, and the mule will disappear from the city railroad lines, as he has already from the Carrollton, as described not long ago in our columns so graphically by Mr. A. Langstaff Johnston. Uncertainty of franchise tenure must always militate against extensions and improvements, and the practice adopted in New Orleans has much to recommend it on public grounds.

Pepper in Siam.

After rice and teak, pepper is the principal export from Siam. In 1892, 1,175 tons were exported—a slight falling off compared with the previous year. The pepper business is entirely in the hands of two British firms here, and as bargains are closed simultaneously at London and Bangkok by telegraph, it is a perfectly safe trade. The price, during the year, continued to fall, ranging from 22 ticals per picul (30*l.* 10*s.* per ton) for white pepper and 16 ticals to 10 ticals (22*l.* 3*s.* to 13*l.* 7*s.* per ton) for black. As recently as 1888 the price reached the high figure of 88*l.* per ton. It would appear that the big profits in those years were made by the middlemen—Chinamen who buy the standing crops, and take all risks of disease and worm. All the pepper sold in the Bangkok market comes from Chantaboon, a district on the east coast of the Gulf of Siam, about 180 miles from Bangkok. The two firms above referred to do business through the shipping agent—a German, who runs a small steamer once a week to Chantaboon. The pepper crop is gathered in March, and is in the Bangkok market about a month later. When the berries are plucked, they are put through a winnowing machine with three compartments. The heaviest berries drop into the first, and after being macerated in water, by which the outer black covering is removed, become white pepper. The lighter and inferior berries of the second compartment form black pepper, and those in the third are waste, from which the best grains are extracted and added to the second kind. Of the export, two-thirds were white and one-third black pepper. All the white is shipped to London and the black to China. The local consumption is small. The freight charged from Chantaboon to Bangkok is about 13*s.* 9*d.* per ton, and there is an inland duty of 1 tical per picul, equivalent to 1*l.* 7*s.* 6*d.* per ton. The prospects for 1893 are good. The quantity seems excellent, and there are no complaints of scarcity, though growers assert, if the price falls any lower, it will be impossible to continue cultivation.—*Consular Report.*

The Rearing of Japanese Children.

Custom and national sentiment would seem to have made the lives of children in Japan delightfully attractive for them. Japan has even been described as the paradise of childhood. One of the most curious points in this connection is that the children are always suckled by their mothers; artificial lactation is altogether unknown. The children are suckled until their sixth year, and in language unmistakable may be heard asking for the lactatious fountain. Thus, as no cow's milk is required, the cow is only used as a pack animal in the cities. In view of the almost universal use of cow's milk in other countries, its exclusion from the diet of the Japanese raises the interesting subject of inquiry as to whether or not the race benefits by this custom, and Dr. A. S. Ashmead, of New York, discusses the question in the current number of the *Sei-i-Kwai* medical journal. In the first place it is assumed that indirectly the absence of cow's milk is most beneficial. In consequence of no other nourishment being available, the Japanese mother is compelled to suckle her offspring, in doing which she feels the compulsion of looking after her own health and diet. Japanese mothers chiefly live on rice, "fish, shells, seaweed, and other products of the sea," while wine and beer are rigidly excluded. The reward of all this meritorious care of motherhood and childhood is the absolute freedom of the children from rickets. Again, the author holds that the transmission of tuberculosis is avoided by the exclusion of cow's milk from the infant's dietary. Japan is by no means exempt from tuberculosis, but the disease mainly prevails among the upper classes, in whom the systematic custom obtains of close intermarriage.—*Medical Press.*

Agricultural Electricity.

An interesting example of electricity as applied to farm work is now in operation at a Scotch farm. The whole of the usual farm machinery, such as thrashing, sowing, corn thrashing, and the like, is here driven by an electric motor. The electricity is generated by water power, the turbine wheel which drives the dynamo being about 1,000 yards from the farm. The electric current is conveyed by underground wires to the house and farm, in each of which a storage battery is placed. These supply the electric current for lighting and motive purposes when the machinery is not working. The whole of the mansion is illuminated by electric light, and an electric motor is provided for pumping the water for domestic purposes.

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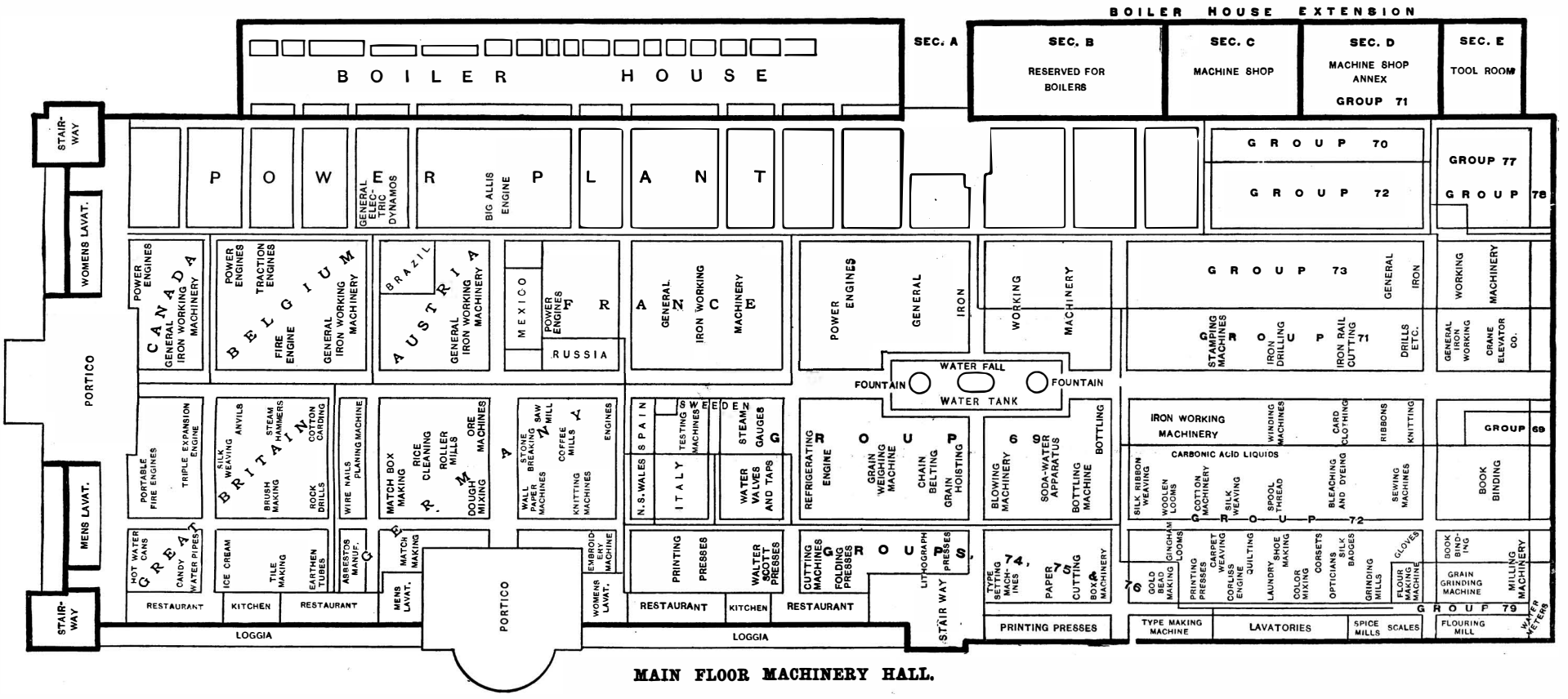
THE WORLD'S COLUMBIAN EXPOSITION—THE PALACE OF MACHINERY.

The Palace of Machinery, which we illustrate, measures with the annex 984 × 1,393 feet. After the Agricultural and Art buildings, the Machinery Hall is probably the most graceful structure on the grounds. The architects were Messrs. Peabody & Stearns, of Boston, and the design is taken from the best types of the Spanish Renaissance, and the details are all thoroughly classic. A covered loggia at the first story gives a fine chance for a promenade in all weathers.

German exhibit the first object of interest which would attract the visitor is the great Allis engine of 2,000 horse power, which drives two huge dynamos that will each furnish electricity enough to drive 10,000 lights. The belts are 72 inches wide. Engines are on every side driving dynamos, so that the scene at night is a very interesting one. The Westinghouse dynamos alone furnish electricity enough for 158,000 sixteen candle power lamps. The two-story marble switchboard, 78 feet long, is one of the curiosities of Machinery Hall, as is also the electric rolling bridge which traverses

Hall, and the articles made find a ready sale among the throngs of visitors who pass through the building daily. Gloves, ribbons, badges, medals and candy seem to have the greatest sale.

A large tank near the center of the building affords an opportunity to display hydraulic machinery. The printing exhibit is very attractive, and a newspaper, *The Daily Columbian*, is printed here daily. The type-setting and type-casting machines are immensely popular as are also the exhibits of match-making machinery. The exhibit of machin-



MAIN FLOOR MACHINERY HALL.

THE WORLD'S COLUMBIAN EXPOSITION—THE PALACE OF MACHINERY.

The beautiful campaniles are filled with chimes of bells which are rung at intervals. The center pavilion on the South Canal façade masks one of the huge arched roofs. Our illustration also shows the termination of the South Canal, the reproduction of the Egyptian obelisk now in Central Park, New York, and the classic colonnade which helps carry out the architectural scheme and at the same time serves as a screen to hide the intramural railway. The colonnade was designed by Mr. C. B. Atwood. Our plan shows the arrangement of the exhibits and the boiler house, etc.

Entering at the northern portico in the center of the the building from time to time and does all of the "heavy chores" connected with the exhibits. The boiler house is very clean, as oil is used for fuel, but it is not visited to any extent, on account of the heat. To the left of the boiler house and not shown in the plan are the pumping works, which have a daily capacity of 40,000,000 gallons. Beyond the boiler house and in the same line is a model machine shop fitted up with high grade machine tools; here any repairs to machinery or engines may be made at short notice. The classification is according to countries, Germany, as usual, making a large and very fine exhibit. There is considerable manufacturing going on in Machinery

ery at Chicago in Machinery Hall cannot be very well compared with the exhibit in Machinery Hall at the Centennial, as many of the exhibits now placed in the Electricity, Mines and Transportation buildings were in 1876 in Machinery Hall. Still, the exhibit on the whole is very creditable. Many of the prominent exhibits have been already illustrated in the SCIENTIFIC AMERICAN and others will appear in the later issues.

IN mechanics, speed cannot be obtained except at the expense of power; nor power be obtained except at the expense of speed.

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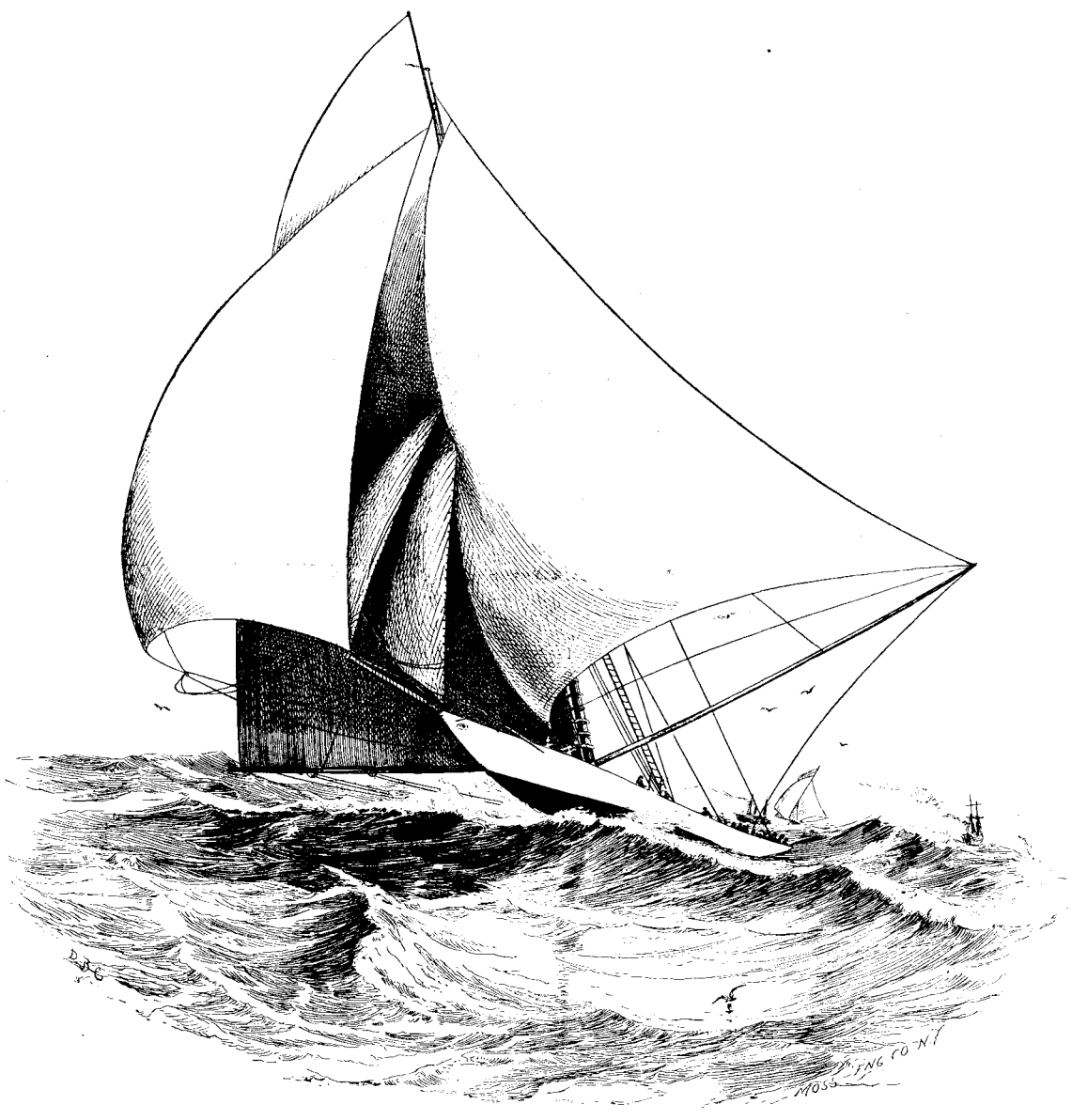
Two Wonderful War Ships.

Provision having been made in the British navy estimates for 1893–94 for the construction of two powerful first-class cruisers, to be named the Powerful and Terrible, *The Engineer* says it has been decided to invite tenders for the construction of the former as soon as the designs have been completed, leaving that of her sister ship until the next financial year. As these ships will be the largest and most powerful cruisers of their class ever built, the following particulars of them, which are open to modification, will be interesting to our nautical readers. The contemplated principal dimensions are as follows: Length, 500 ft.; breadth, 70 ft.; displacement at mean draught of 27 ft., 14,000 tons. The vessels are to be constructed of steel throughout, but as they are intended to keep the sea for lengthened periods, they will be sheathed and coppered. The proposed continuous sea speed in smooth water is to be twenty knots, but on the eight hours' natural draught trial the expected speed is twenty-two knots an hour. To secure the former each vessel will be fitted with engines and boilers capable of developing a power fully sufficient for actual requirements. For the protection of the vital parts of the ship, which include the engines, boilers, magazines, etc., they will be covered by a strong turtle-back deck of steel, having a maximum thickness of 4 in. amidships, reduced toward the extremities. Between this and the main deck, for the whole length of the engine and boiler space, these vessels will, like all the other first-class cruisers in the navy, be subdivided into numerous coal bunkers. At the normal displacement and draught of the ship—14,000 tons and 27 ft.—about 1,500 tons of coal will be carried, but provision will be made for a bunker capacity of 3,000 tons. The vessels will be propelled by twin—in preference to triple—screws, their efficiency within the limits of the proposed power and draught having been established by previous experience in our largest cruisers, as well as in the large twin-screw vessels of the mercantile marine. The armament of the vessels will comprise two 9·2 in. breech-loading guns, mounted at bow and stern as chasers, twelve 6 in., eighteen 12-pounders, twelve 3-pounder quick-firing guns, and several machine guns. The 9·2 in. and 6 in. guns will have armored protection, and the 12-pounder guns will be fitted with strong shields, revolving with the guns. Special study has been given to the protection of the guns and their crews and the transport of ammunition from the magazines to the guns. For the protection of the commanding officer in action an armored conning tower is to be erected at the break of the forecastle. To enable the bow and stern chase guns to be fought in heavy weather and to maintain speed at sea, an unusual height of freeboard at the poop and forecastle, upon which these guns are carried, is provided. In addition to the guns carried by these vessels they will be supplemented by four torpedo dischargers, which will be submerged and placed in separate rooms.



THE AMERICAN YACHT VIGILANT.

Railway Schools in Russia.

There are in Russia special institutions called technical railway schools, for the special education of people for the railway service, viz., engine drivers, engineers, their assistants, road masters, etc.

At the present time there are twenty-eight technical railway schools, of which twenty-five belong to the government, and three which, although remaining private, are also under the inspection of the Ministry of Communication.

The pecuniary fund, which covers the expenses for maintaining the schools of the government, consists especially of sums which are paid to the Ministry of Communication by the majority of railways, to the amount of 15 rubles per verst of the railway lines open for traffic.

To this main source of income are added the annual payment of 10 rubles from every pupil, the sums realized by the sale of pupils' handiwork, useless property and materials, etc.

This fund, under the name of general school fund, consists at the present time of a capital of nearly 1,500,000 rubles and an income amounting to 500,000 rubles per year.

The annual maintenance of the twenty-five government schools costs more than 400,000 rubles.

At the root of the whole internal economy of these schools there is a strict discipline, as the employment for which the pupils are prepared demands, beyond a definite circle of knowledge and practical understanding, a particular punctuality in the execution of their service and a perfect subordination to discipline.

The whole course of instruction of the technical railway schools lasts five years, three years of which are for study in school and two years for practice on railways. During the three years of study in school there is taught: *a*, religion; *b*, elementary mathematics, with the fundamental knowledge of bookkeeping and land surveying; *c*, general knowledge of physics and practical knowledge of telegraphy; *d*, a short course of general and applied mechanics (descriptive); *e*, a short course in working wood and metal; *f*, elementary knowledge of architecture; *g*, practice of railway business; *h*, elementary and special drawing by hand and with the aid of instruments, as well as calligraphy; and *i*, handicrafts, as locksmiths', blacksmiths' and joiners' work. Besides this there are introduced into the school singing and gymnastics.

Considerable attention is apportioned to practical training in handicrafts and drawing. The training in handicrafts is conducted by experienced teachers with special technical education in special teaching workshops.

After having finished the three years of study in class the pupils are sent off for two years' practical training on railways, where they work in workshops, in repairs of the line, on locomotives, partly on the telegraph, etc.

The annual number of pupils instructed in the railway schools amounts to above 1,500, and this number has increased of late.

THE launch Daimler, built by the Daimler Motor Co., of 111 East 14th Street, New York City, has distinguished itself in the way of valuable practical service, besides affording one of the attractions of the Exposition. Six men sailing in a small yawl, about half a mile out in the lake, were capsized by a sudden gust of wind, and some of them, at least, would have been drowned, had it not been for the rapidity with which the launch reached and rescued them. On another occasion the launch had the honor of going out and towing in the Viking ship, when the latter was unable to make port on account of head winds.

The Chocolate Tree in Trinidad.

We learn that Mr. J. H. Hart, Curator of the Royal Botanic Gardens, Trinidad, has recently returned from a visit to Central America, after having successfully transported thither no less than twenty-five thousand plants of Trinidad cocoa. In return, he has conveyed to Trinidad two highly desirable varieties of the *Theobroma cacao*, and two species new to that colony, and already numerous plants of each are thriving well. One of the varieties is a purely white-seeded one, producing large pods and splendid beans, which require only forty-eight honrs' fermentation instead of the ten days usual in Trinidad. The second variety, known in Nicaragua as "alligator cacao," is peculiar from the soft covering of its pod and the raised instead of indented sectional ribs. The new species are *Theobroma bicolor* and *Theobroma sp.*, the latter known as "cacao meco," "cacao mono," or "monkey cocoa."

THE YACHTS CONTENDING FOR THE INTERNATIONAL CHAMPIONSHIP.

The series of races in which the Valkyrie, as the British champion, in competition with the American yacht Vigilant, is endeavoring to win back the prize cup originally won in England by the yacht America, has attracted more attention than any other competition of the kind which ever engaged the attention of the yachting world. It has also excited to a remarkable degree feelings of international rivalry, happily of an altogether friendly and amicable nature. Our illustrations represent the rival yachts under sail, one of the views also showing the Valkyrie out of water in drydock, bringing out her full lines.

As announced by the official measurer of the New York Yacht Club, the dimensions of the two yachts are as follows:

Vigilant—Length on load water line, 86·19 feet; from end of boom to forward side of mast, 99·37 feet; from fore side of mast to end of jib stay, 73·80 feet; from fore side of mast to jibtopsail stay, 75·90 feet; from fore side of mast to forward point of measurement, 74·85 feet; from fore side of mast to outer end of spinnaker boom, 74·62 feet; deck to upper side of main boom, 3·08 feet; deck to topsail halyard block, 125·96 feet; deck to hounds, 69·08 feet; length of topmast, 56·88 feet; length of gaff, 54·76 feet.

Valkyrie—Length on load water line, 85·50 feet; end of boom to forward side of mast, 92·60 feet; forward side of mast to jib stay, 66·16 feet; fore side of mast to jibtopsail stay, 66·16 feet; fore side of mast to forward point of measurement, 66·16 feet; fore side of mast to outer end of spinnaker boom, 72 feet; deck to upper side of boom, 3·03 feet; deck to upper side of topsail halyard block, 114·86 feet; deck to hounds, 63·30 feet; length of topmast, 51·56 feet; length of gaff, 55·57 feet.

Figured from the above, their measurements are reduced to the following:

	Vigilant. Feet.	Valkyrie. Feet.
Sail area	11,272	10,042
Ordinary racing measurement	96·18	.....
International racing measurement	96·78	93·11

Vigilant allows Valkyrie 1 minute 48 seconds in a race over a thirty mile course.

A technical expert, Mr. Irving Cox, makes the following comparison of the two boats, which we condense from the New York *Sun:*

The two vessels represent very different principles in yacht designing. The Vigilant depends for her speed on moderate displacement, extremely easy lines, great stability, due to excessive beam, and light weights aloft; the Valkyrie on narrow beam, fine entrance, and stability, obtained by a powerful bilge, very low lead, and light hull. The Vigilant for holding on to windward depends on good draught, a perpendicular keel, and a centerboard. The Valkyrie expects to accomplish the same object by means of excessive draught, a great deal of vertical keel, and by the form of the vessel's side when keeled. The Vigilant has a centerboard weighing 3 tons, 20 feet

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long, which drops 10 feet, making her draught 24 feet. The draught of the Valkyrie is 18 feet. The masts of both vessels are of Oregon pine, that of the Valkyrie being 21½ inches in diameter, and that of the Vigilant 20 inches. The bottom of the Vigilant is covered with Tobin bronze and that of the Valkyrie with copper.

Submarine Photography.

BY JOHN HUMPHREY.

Several of the difficulties experienced in endeavors to ascertain the natural relations of objects existing at considerable depths under water have been overcome by M. Louis Boutan, in a remarkably ingenious manner, and the contrivances he adopted are described in a recent communication to the Paris Academy of Sciences.

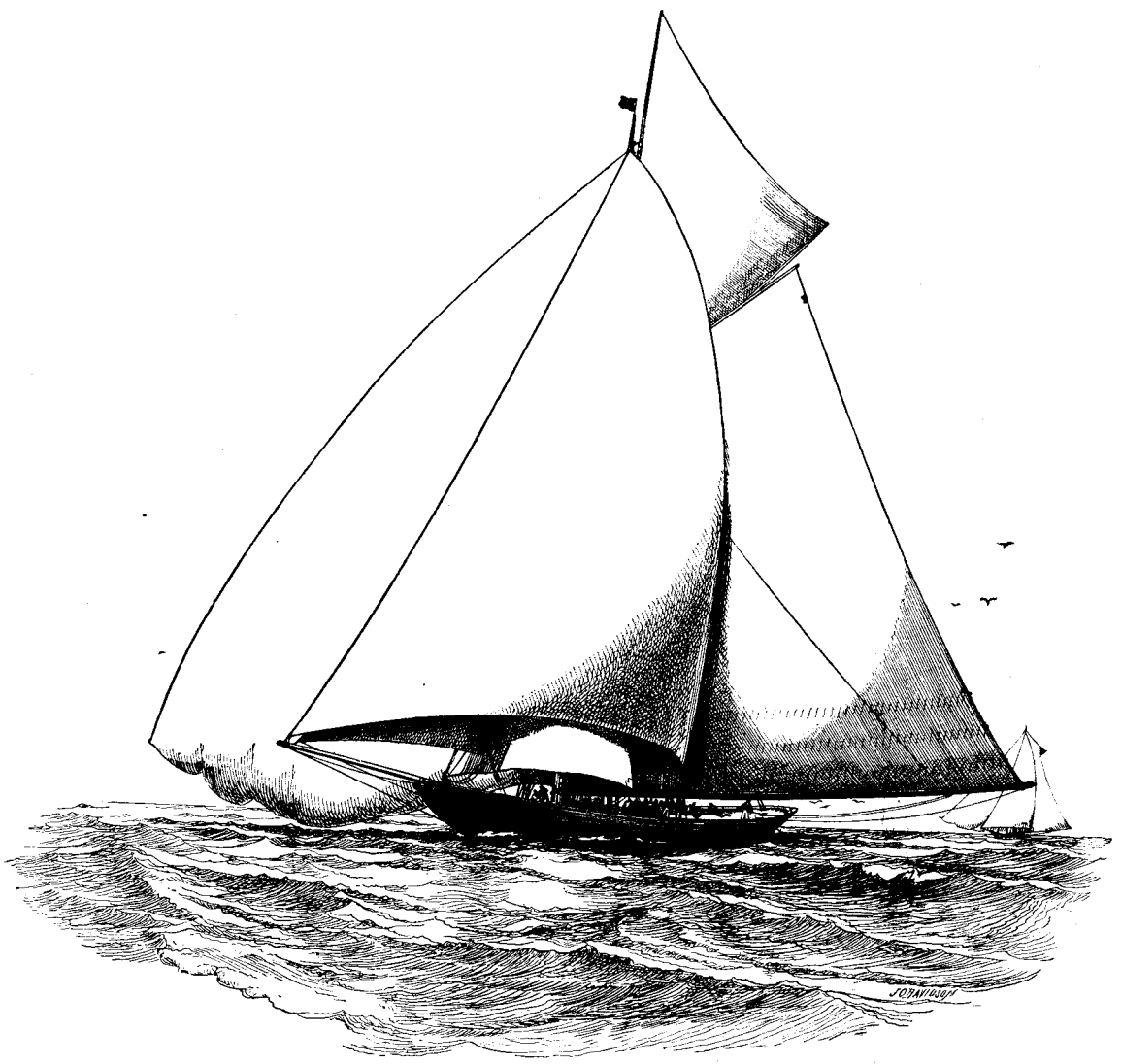
He prefers to use a small camera in which several plates can be exposed consecutively, and incloses this in a rectangular, water-tight metal box, into the sides of which plates of glass are inserted to serve as windows. The camera can be so disposed that the lens may face all the windows in turn, if desired, and exposures are regulated from outside the metal case. To avoid any ill effects that might be caused by differences in the internal and external pressure when the apparatus is sunk in deep water, a kind of balloon filled with air is connected with it. As the pressure increases, in descending, the balloon is compressed, extra air is thus forced into the box, and the pressure on its walls equalized. A stout foot to support the apparatus and weights to sink it complete it for practical purposes.

In water near the shore, not greatly exceeding one meter in depth, the apparatus can be conveniently fixed, without the operator needing to enter the water, and, by direct sunlight, good negatives can be obtained in ten minutes. When the water is deeper the operator must descend in diving costume to fix the case securely on its stand before commencing the actual work of photography. In calm, bright weather photographs can then be obtained by direct sunlight in from thirty to fifty minutes. Colored glasses, preferably blue, must be interposed between the objective and the water, in order to obtain sharp images.

By the use of artificial light to illuminate the surroundings, however, matters are still more simplified. To this end, M. Boutan has contrived a special magnesium lamp. A cask of two hundred liters capacity is filled with oxygen gas, and on its upper end is fixed a spirit lamp, which is covered by a bell glass. A vessel containing magnesium, in powder, is connected with this lamp in such a manner that the metal can be projected across the flame by the action of a rubber ball which serves as bellows. The oxygen gas, of course, is intended to assist combustion, and the lamp having been lighted and covered by its protecting globe, the cask simply requires weighting to sink it.

Good instantaneous negatives have thus been obtained by M. Boutan during a violent storm, when no day light could penetrate the depths. They are lacking as regards background, but this he attributes to imperfections in the apparatus, particularly the objective. He also found it necessary to place before the lens a diaphragm of very small aperture to secure a sufficient degree of sharpness. If a formula were calculated for an objective, the front of which might be exposed to sea water, he thinks these drawbacks might be remedied.

As it is, he has proved that photographs can be taken in a brief time under water, in calm weather, by direct sunlight, at depths up to six or seven meters; while, by the use of his special lamp, they can be taken, instantaneously, at any depth that can be conveniently reached by a diver, and the state of the weather is of no importance.

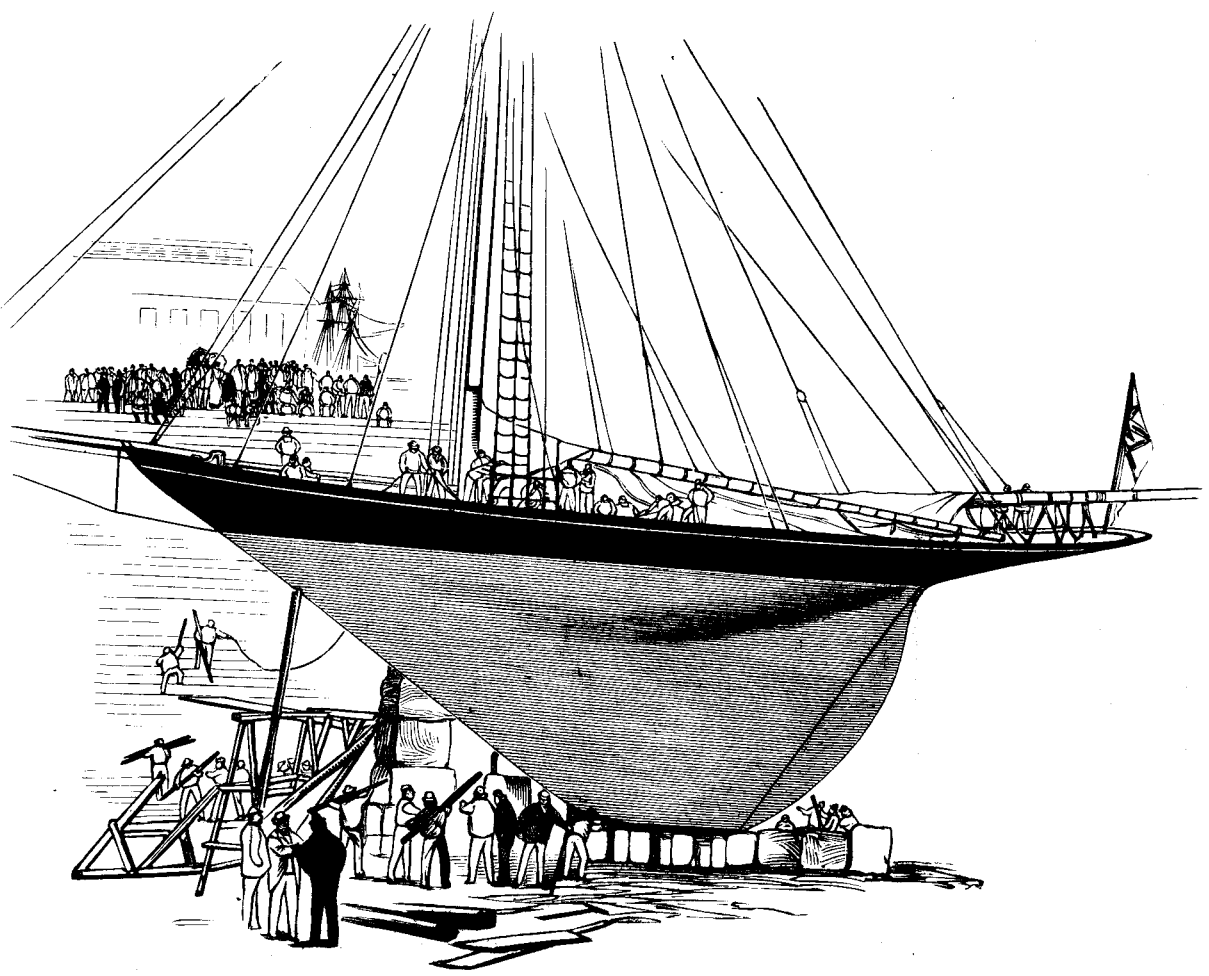


THE ENGLISH YACHT VALKYRIE.

The Trial Trip of the Castine.

The new gunboat Castine, or No. 6, as she was formerly called, had her speed test September 15, off New London. The result of the trial trip was a signal triumph for her builders, the Bath Iron Works, of Bath, Maine. The contract speed was 13 knots per hour; but on her speed test an average speed of 16 032 knots was sustained, after making the usual deductions for tide, etc., thus beating her sister ship the Machias. The bonus which the builders of the Castine will receive will amount to $60,000. The engines made 238 revolutions, with steam at 165 pounds, a large part of the distance. The course was 60 miles and her official time was 3 hours 39 minutes 12 seconds. The speed of the Castine was 16·4 knots, but some corrections had to be made, which brought the official speed down to 16·032 knots. The sea was more unfavorable than when the Machias made her trial trip. The government has again obtained in the Castine a better boat than was bargained for, and will doubtless be very willing to pay the extra allowance.

The Castine is a steel boat, 190 feet long, 32 feet beam, mean draught 12¾ feet, displacement 1,050 tons, aggregate horse power 1,600, speed 14 knots. Her engines are of the vertical, inverted, direct-acting, triple-expansion type, the cylinders being 15, 25, and 34 inches in diameter. She will carry 250 tons of coal, and her nominal cruising radius is 4,600 knots. The Castine has a protective deck, and her battery consists of eight 4-inch rapid-fire guns, two 47-millimeter and two 37-millimeter revolving cannon, as well as one 1-pounder and one Gatling gun.



THE ENGLISH YACHT VALKYRIE IN DRYDOCK.

Plated Silk Stockings.

Speaking of American imitation silk hosiery, *The American Silk Journal* recently said that the enterprise and skill of American silk hosiery manufacturers has, it is represented, very nearly driven the foreign lisle thread stocking out of the market. There are some cheap German lisle thread goods sold, but the bright lisle thread, such as are produced by the English manufacturers, and are among the most durable and dainty of hosiery fabrics, are no longer imported to any considerable extent. Even French lisle can seldom be found in the city marts where high-class goods are usually sold. A well qualified authority explains the cause for this notable transition in the market. The moment the manufacturers of the United States could produce a "plated" silk stocking (which is a cotton stocking with a silk face) at a lower price than that obtained for a brilliant lisle thread, there was, he says, no longer any call for lisle thread. The merchants of New York and elsewhere have long since discovered that the fabrics that create the highest exhibition of value, however specious their worth, have the best prospect of pecuniary success. The woman of fashion does not purchase her gossamer-like hosiery of pure silk for wear, but because they please her eye, and her less wealthy sisters usually imitate her. There are few stockings costing over a dollar a pair sold now, except those of silk and of American manufacture. Next in price to the silk-faced hosiery or "plated" silk stocking, which sells at from sixty cents to one dollar and twenty-five cents a pair, is the spun silk article. This is a durable fabric, but not so strong as one of bright silk, which can be purchased at the same figure, and it is not as popular.

THE preliminary surveys for the Pacific Railroad required four seasons, and cost over $1,000,000.

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RECENTLY PATENTED INVENTIONS.

Engineering.

ROTARY ENGINE. — Charles H. and Alonzo Stone, Ringgold, Texas. This improvement comprises a cylinder with inlet and exhaust ports between which slides a gate, a piston traveling in the bore having an arm secured on the main driving shaft, while the gate is actuated by a cam mechanism. The steam chest has a piston valve to control the inlet port, the valve being actuated in one direction by the steam to open the port, while an eccentric cam on the main shaft moves the valve in an opposite direction to close the inlet port. The steam can be cut off at any point in the stroke of the piston, thus utilizing its expansion to the fullest extent.

WATER WHEEL.—Edward N. Andrews, New Britain, Conn. In this wheel, which is designed for use wherever a water or paddle wheel is employed, the paddles are pivoted at their centers, and thus are balanced and self-reversing, being so arranged that when in propelling position forward or backward compartments will be formed confining the water between the paddles and the body of the wheel, imparting a maximum pressure until the paddles are carried upward by the wheels, when the paddles reverse themselves and discharge the water.

MECHANICAL MOTOR.—John E. West, Centralia, Washington. A rope to which is attached a weight passes over a winch drum at the base and a loose pulley at the top of an upright frame, and the drum shaft is connected with a gearing, an escapement, and a crank, affording a simple, inexpensive, and reliable mechanism to utilize the force of gravity afforded by a falling weight, and convert rotary motion into a vertical reciprocal movement to actuate the plunger of a pump, or for other purposes.

HOT AIR FURNACE. — Christopher M. Bridges, Seattle, Washington. The exterior shell of this furnace is made in sections, fastened together in any suitable way, the combustion chamber within forming with the shell a hot air compartment. There is a hot air casing within the combustion chamber, and a dome with which the hot air casing communicates is provided with nozzles projecting into the outlet flues, cold air pipes admitting air to the hot air compartment and casing. The construction is simple and durable, and designed to quickly heat the incoming air and keep it pure.

Railway Appliances.

MEANS OF PREVENTING RAILWAY COLLISIONS.—Eduardo M. De Monte and Carl Jost, Bombay, India. According to this improvement the line is divided into a series of sections, each arranged to be automatically closed at the forward end by the train as it enters the section. An electro-mechanical controlling apparatus is automatically operated to thus prevent collisions, from negligence or otherwise, the arrangement being such that the mechanism of one apparatus is set in motion by an electric current from the batteries of the apparatus at the other end of the section, there being at the side of the rail at the end of each track section a transposing lever adapted to be actuated by the broadened flange of a locomotive or other wheel, means for connecting each lever with the corresponding apparatus, a switch mechanism for operating the switches, and means for connecting the switch mechanism with the corresponding apparatus.

TRAIN ANNUNCIATOR AND ALARM.—Alfred E. Watts, Duluth, Minn. A clock having a series of electrical contacts, an annunciator provided with an electric bell, and a rotating electric disk upon which are the names of stations and the hour of arrival and departure of a train, are so arranged that the annunciator will be operated by an electric circuit under the control of the clock. The improvement affords a simple and effective mechanism for indicating the departure or arrival of trains, for the convenience of passengers.

CARBURETOR.—Harry B. Cornish, Hampton, Iowa. This is a simple and inexpensive apparatus, especially applicable for use in lighting railway trains, carbureting air by forcing it through a body of hydrocarbon, that the vapor thus evolved may be burned as a gas. It is so constructed that the gasoline, naphtha, etc., used cannot possibly escape from its tank, even should the car tip over, automatic valves shutting off both the fluid and the air when the car is excessively tipped. The apparatus is also generally useful as an efficient and safe means of lighting.

Mechanical.

FLUE CUTTER.—Eber W. Pratt, Ipava, Ill. This device has a cylindrical body with an annular flange adapted to rest against the outer end of the tube, and a square central aperture in which is inserted a mandrel having a suitable handle. In the body are radial apertures in which move cutters adapted to be forced outward by the pressure upon their inner ends of the tapering inner end of the mandrel, as the latter and the body are turned by means of the handle. An enlargement or head upon the extreme end of the mandrel prevents its entire withdrawal from the body, and springs return the cutters to an inner position when the mandrel is withdrawn.

BEARING.—Olaus B. Jacobs, Fremont, Washington. In both sides of the hub of a pulley are cups holding balls, and the hanger has cup-shaped sides overlapping and inclosing the cup portions of the pulley hub, while cones are detachably secured to the inner surface of the cup-shaped sides of the hanger in position to engage and impinge upon the balls, thus forming a ball bearing of novel construction to minimize the friction.

SANDPAPER WHEEL. — Frederick H. Stubbe, New York City. According to this improvement the spindle provided with a working face of sandpaper has a diametrical slot leading to an interior recess, in which is a clamping bar adapted to clamp both ends of the paper, and draw it tightly to its elastic cushion upon the periphery of the spindle. The arrangement is such that the adjustment of the paper, and its removal when worn out, are effected with great facility.

NUT LOCK. — Theodore Martin, Wallaceburg, Canada. This improvement comprises a washer having a series of projections arranged in pairs about its edges, a locking key resting between the nut and the projections, and one of the projections holding the key against displacement, while the other is designed to be bent down upon the key to hold it against the nut. The device will lock a nut in a number of different positions, and either on the square or bias.

Agricultural.

HORSE HOE.—Crispus Cottis, Epping, Eng. In this implement the side bars are pivoted to be capable of adjustment latterly to suit the width of the rows between which the tines are to act. The implement is light and strong, may be readily expanded and contracted and compactly folded up, and the stocks of the tines are adjustable along the side bars and also about their own vertical axes, to keep the tines forwardly directed, whatever the degree of expansion of the frame. Special means are provided for securing the hoe point or share to the tine, and by the use of points or shares of various forms the machine is adapted for heavy or light work.

BROODER.—Ambrose B. Shaub, Beach City, O. The casing of this device has partitions forming several compartments, in the center one of which is a heating drum, with air-distributing pipes extended to heat the other compartments from above, while a water receptacle incloses the upper end of the heating drum. The young chickens can readily pass from one compartment to another, or into the yard, and the proper ventilation and heating of the several compartments is readily obtained.

The Household, etc.

LAMP.—Delmar D. Pinkham and Frank E. Lewis, Longview, Tex. These inventors have designed a simple and effective mechanism for creating an air blast for a chimneyless lamp. An air space surrounds the oil reservoir, and in the hollow standard below it is a small electric motor, the revolving armature of which operates a fan to cause an upward current of air. Removably secured in the lamp base is a dry battery, and a conveniently arranged switch in the connections enables the motor to be stopped and started, as desired, its operation affording an air blast designed to insure a clear, steady flame, without the aid of a chimney.

CANDELABRUM.—Charles S. Koehler, Brooklyn, N. Y. This is a sectional device, the parts of which may be quickly separated and put together, and the candle-carrying arms are adjustable from a common center horizontally or at any desired angle, two sets of such arms, at least, being located on a standard, each set independently adjustable. The candlesticks are preferably arranged equidistant along the arms, the inner ones being also equidistant from the fixed candlesticks upon the standard heads.

FRUIT HOLDER.—William Nicholson, Brooklyn, N. Y. This is a simple device with which to hold oranges and similar fruit, for more conveniently eating such articles without danger of soiling the fingers or hands. A small cup, of a size to receive half an orange, has a base, and hinged at the top edge of the cup is a ring provided with inwardly and downwardly projecting prongs adapted to engage the fruit and hold it in place, the prongs being engaged or disengaged by closing or opening the ring.

HEAT REGULATOR FOR OVENS.—Anton Bednarz, New Lisbon, Wis. This is a device to allow the hot air to escape when an oven is becoming too highly heated. A plate with a wire gauze-covered opening is arranged to establish communication between the interior of the oven and the external air, the plate having standards for supporting and guiding an expansion bar, and actuating levers, one of these levers carrying a cover for closing the opening. The expansion bar, as it is lengthened by excessive temperature, actuates the lever to uncover the opening.

PLANT PROTECTOR.—Joseph Garbesi, Moundsville, W. Va. A sheet of paper is folded to form a cone-shaped body, the contact parts united by waterproof cement, and the inner and outer faces of the body are coated with coal tar, an additional sand coating being applied on the outer face. This very simple and inexpensive protector is well adapted to set over plants to protect them from sudden changes of temperature, the coal tar covering causing the heat to be retained in the protector overnight, and the smaller sizes may be conveniently employed as transplanters, etc.

CLOTHES PIN.—Hattie Merrill, Westphalia, Kan. A single piece of wire is bent into W shape, with the two portions in the middle forming loops, and the outer and upper portions of the loops are bent outwardly to form spring coils, then extended continuously across the ends at right angles to prevent the rising of the clothes line. The device has an easy and full spring action, adapting it to pass over and securely hold heavy articles of clothing as well as light ones, without danger of tearing or injuring the clothes.

CLOCK-WINDING MECHANISM.—Martin Everhart, Austin, Tex. The periodical automatic winding of a clock by water power is effected by the mechanism designed by this inventor, which utilizes the power afforded by the gravity of water discharged at regular intervals from a tank in elevated position, where it may be kept supplied by the ordinary rainfall upon the roof. In the clock casing is a vertically reciprocating water receptacle, with gravity valve in its base, and a rotatable horizontal shaft on which are pulleys connected with the winding arbors of the clock, while a device for operating a valve at the lower end of the conductor pipe leading from the elevated tank is controlled by one of the connections between the winding armors and the pulleys on the horizontal shaft.

FIRE KINDLER. — Perry S. Grindle, Brooklyn, Ala. A moulded cake, of proper dimensions for efficient and economical use as a fire kindler, has been designed by this inventor. Among its ingredients are sawdust, resin, and a combustible cement of coal tar, asphaltum, etc. When pressed into shape, the substance remains consolidated without becoming sticky, does not disintegrate with age, and is sufficiently inflammable to readily ignite a mass of coal in a stove without the use of other kindling material.

Bicycles, Vehicles, etc.

BICYCLE.—William Y. Cocken, Tiffin, O. The vibratory strain and the shock incidental to the severe use of a safety bicycle are designed by this improvement to be greatly reduced and taken up, correspondingly increasing the comfort of the rider. The main frame has its seat bar or backbone connected at its front end to the steering head by a spring connection, its rear end being similarly connected with the rear wheel fork frame. These connections are so arranged that the weight of the rider will assist in carrying the wheels over an obstruction instead of retarding such movement, as is the case with rigid frames. The brake mechanism is operated through the steering head, and suitably arranged movable bearings receive the propelling axle.

BICYCLE GEAR.—Erick J. Swedlund, Atwater, Minn. This inventor has designed a strong and simply constructed gear, comprising a locking or clutch mechanism carried by the driven wheel and normally connecting it with the drive wheel, the arrangement being such that it may be readily thrown in and out of gear by the rider, to permit of traveling with less speed and increased power, as may be desired in going up hill or over rough roads, or *vice versa*. When the machine is thrown in gear at the time of going down a hill the operator can hold the pedals and axle at a standstill, resting his feet on the pedals.

FIFTH WHEEL.—Caleb R. Turner, Brooklyn, N. Y. This invention covers an improvement on a previously patented invention in which a series of revoluble bearing rollers is held between upper and lower plates, the lower plate being carried by the running gear, and the upper plate supporting the superstructure of the vehicle. The roller bearing consists of a single ring, having an exterior circular series of studs supported from the ring by one end, the studs carrying rollers, over which fits a circular channel iron, forming a support for a superstructure.

THILL COUPLING.—Nicholas I. Woolsey, Lawrence, N. Y. According to this improvement, the thill iron has a head with downwardly extending parallel jaws to receive the coupling bolt between them, the jaws being transversely bored and having at one end cam grooves, which are entered by end lugs of the pin, while an anti-rattling spring, abutting with its free end on the axle clip, is held on the back portion of the thill iron. The device is very simple and inexpensive, and with it the thills or a pole may be quickly attached to or removed from a vehicle, but only when the free ends of the thill or pole are down, and the tension is thus removed from the anti-rattling springs.

HEATING AND LIGHTING VEHICLES.—Napoleon B. Ross, Gilboa, O. In a casing supported in the bottom of the vehicle is held a lamp in such position that its light is thrown around the vehicle upon the road, while its heat passes through the casing to the interior of the vehicle. A special cover in the bottom of the vehicle excludes the heat when desired.

BRIDLE.—Harvey S. Hill, Ithaca, Mich. This bridle has cheek pieces with rein-receiving rings, in which a cord is fixedly held by its ends, a nose band being also fixed held to one of the rings and loosely passed through the other, its free end being adapted for connection with a rein, the arrangement being such that a pull on the cheek pieces exerts tension on the cord. The device is cheap and simple, and adapted to connect with and be operated by the ordinary driving reins for effectively subduing vicious horses.

Miscellaneous.

COAL-WEIGHING BASKET.—Thomas C. Du Pont, Central City, Ky. In weighing two grades of coal separately for settlement with the miner, and weighing them together in loading the car, a grade of mixed coal is sometimes not weighed, but estimated, which it is the design of this improvement to obviate. Combined with the inclined screen and coal-weighing basket, having a hinged section at its lower end, is a subjacent transfer chute attached to the bottom of the basket, with a screen arranged in line therewith, and a hinged section for holding or discharging the contents of the transfer chute, the invention also covering other novel features.

FREIGHT OR PARCEL CARRIER. — Henry C. Forney, Philadelphia, Pa. This carrier comprises a circular car with an annular rib, in which is a door, and side trunnions having clutch faces, to be used in connection with a track having an inclined section, upon which the car rolls, there being also a combined power and relay station with adjustable boxes constructed in sections and automatically operated and adapted to journal the car, in connection with a brake and power mechanism, the brake engaging the periphery of the car and the power mechanism engaging the axis of the car. This carrier is designed to transport mails, packages, merchandise, etc., traveling a long distance by gravitation, and traveling for a certain space on its own stored power.

ASPHALT PAVEMENT. — Charles H. Bull, New York City. The roadbed is preferably formed of broken stone, cemented together with hydraulic cement, to form a base for an asphalt sheeting composed of sand, asphalt, and heavy petroleum oil, there being stirred in during the process of admixture a proper proportion of fibrous or filamentary material, such as hair, metal strands, or vegetable fiber, to bind the composition throughout its mass, and also bond it to the concrete base by the downwardly projecting filaments.

ARTIFICIAL STONE.—Granville M. Breinig, New Milford, Conn. This is a composition consisting essentially of crushed quartz, ground calcined quartz, and a hydraulic cement, prepared and compounded in a special manner for different uses, and so as to produce an artificial stone of superior qualities and usefulness, extremely well adapted for floors, sidewalks, curbstones, drains, or similar purposes. It admits of a hard, fine surface finish, and possesses great durability and resistance to the action of the elements, dampness, etc. Any desired coloring matter may be added in the manufacture.

WINDOW PACKING AND ANTI-RATTLER.—Stephen R. Kirby, New York City. The sliding sashes, according to this improvement, have opposite meeting rails with longitudinal and opposite recesses, and a packing gasket is secured to the upper wall of the recess in one rail and a flexible metallic packing strip at one edge in the recess of the opposite rail. The improvement may be cheaply and easily applied to a new or old window, making an air-tight seal which will also hold the sashes so as to prevent rattling. The packing can be readily adjusted to suit windows varying in looseness.

OPENING OR CLOSING DOORS.—John H. Whitaker, Davenport, Iowa. This is a simple, inexpensive and easily operated mechanism by which the opening and closing of a door are accomplished by means of levers, which are made to open the door by the weight of the person about to pass through the door, the closing of the door being effected by a counterweight operating the levers for a reverse movement.

NEGATIVE AND SCREEN HOLDER.—James Scouler, San Francisco, Cal. This is a device for use in photo-engraving, to hold the negative and sensitive plate in proper relation to each other, thereby avoiding the necessity of adjusting the screen for each plate. It consists of a frame rabbeted on one side and provided with supports for holding a sensitive plate in the rabbeted side of the frame, spring buttons being pivoted on the opposite side of the frame for holding a screen in this side.

PERPETUAL CALENDAR. — Daniel A. Holtzman, Myerstown, Pa. This device is arranged in an upright cylinder mounted on a suitable base and turned by a handle at the top, the cylinder having slots lettered to represent the days of the week, and a drum within the cylinder having groups of dates representing the years of a century. The device may be readily adjusted to suit the different years, months and days, and by its means any particular day may be quickly and accurately ascertained.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

SCIENTIFIC AMERICAN BUILDING EDITION.

OCTOBER, 1893.—(No. 96.)

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3. A dwelling erected at Holyoke, Mass. Perspective view and floor plans. A model design. Cost $6,900 complete. Mr. B. P. Alderman, architect, Holyoke, Mass.
4. A suburban cottage erected at New Haven, Conn., at a cost of $2,854 complete. Floor plans, perspective view, etc. Messrs. Wilson & Brown, architects, New Haven, Conn. An excellent design.
5. Engraving and floor plans of an elegant residence erected for W. R. Mygatt, Esq., at Denver, Col., at a cost of $28,000. Messrs. Lang & Pugh, architects, Denver, Col.
6. The beautiful residence of Mr. Walter Dunning, at Denver, Col., erected at a cost of $26,000. Floor plans and perspective elevation. Messrs. Lang & Pugh, architects, Denver, Col.
7. A cottage at Hartford, Conn. Floor plans and perspective elevation. A unique and convenient design.
8. A residence at Carthage, Ill., erected at a total cost of $4,500. Perspective view and floor plans. Mr. G. W. Payne, architect, Carthage, Ill.
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Order pattern letters & figures from the largest variety. H. W. Knight & Son, Seneca Falls, N.Y., drawer 1115.

Stow flexible shaft. Invented and manufactured by Stow Mfg. Co., Binghamton, N. Y. See adv., page 222.

"U. S." metal polish. Indianapolis. Samples free.

Improved iron planers. W. A. Wilson, Rochester, N.Y.

For Sale—36"x24' Eng. lathe, $450. S. M. York, Clev., O.

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Heading machinery. Trevor Mfg. Co., Lockport, N. Y.

Microbe Killer Water Filter, McConnell Filter Co., Buffalo, N. Y.

For Sale—Patent No. 443,561, Dec. 30, 1890. Expansion Pulley. Address John G. Avery, Spencer, Mass.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Centrifugal Pumps. Capacity, 100 to 40,000 gals. per minute. All sizes in stock. Irvin Van Wie, Syracuse, N.Y.

Partner Wanted—Armstrong's Automatic Washer. Patented Aug. 22, 1893. A. Armstrong, 817 Lucas Ave., St. Louis, Mo.

Emerson, Smith & Co., Ltd., Beaver Falls, Pa., will send Sawyer's Hand Book on Circulars and Band Saws free to any address.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

For the original Bogardus Universal Eccentric Mill, Foot and Power Presses, Drills, Shears, etc., address J. S. & G. F. Simpson, 28 to 36 Rodney St., Brooklyn, N. Y.

Patent Electric Vise. What is claimed, is time saving. No turning of handle to bring jaws to the work, simply one sliding movement. Capital Mach. Tool Co., Auburn, N. Y.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(5418) W. S. writes: 1. Is a motor with 3 pole armature as efficient as a Gramme ring armature, such as the motor in No. 641 SCIENTIFIC AMERICAN SUPPLEMENT? A. On general principles it is not so efficient. 2. How are three-pole armatures wound and connected? A. They are connected to a three-piece commutator, Gramme ring fashion. All poles are wound in same sense. 3. I see some electric batteries advertised to run for 24 hours before the solution is exhausted; would like to have the recipe for such a solution? A. It is not so much a question of solution as of quantity in proportion to current taken. Use a good bichromate mixture. 4. Is the electromotive force the same in two bichromate batteries, one the size of a thimble, the other the size of a barrel? A. Yes. 5. Could a ⅛ H. P. motor be run with small batteries size of a thimble, if armature was wound with No. 25 cotton-covered wire? A. If you had enough. 6. Would any ingredient be rendered insoluble if bichromate of potassium were added to it? A. Bichromate of potassium renders glue insoluble after drying and exposure to sunlight.

(5419) G. H., Jr., asks if paint can be manufactured from aluminum. If so, what color would it be. A. Yes. If oxidized, the color would be white.

(5420) A. H. R. asks: Will the electroplating dynamo described in "Experimental Science" run an 8 inch screw-cutting lathe (when the dynamo is used as a motor), with a current derived from the large plunge battery? Or would a motor with a drum or ring armature be better? Would like to make the motor myself, if you will kindly furnish the required information as to size of wire, etc., through the columns of the SCIENTIFIC AMERICAN. A. The plating dynamo to which you refer is too small to answer as a motor for driving your engine lathe. Better make the motor after the plans given in SUPPLEMENT 600 for the construction of an eight-light dynamo.

(5421) H. W. F. says: Dealers in photographers' supplies sell a solution which they call "toning solution," and which they use with a solution of bichloride gold and sodium for toning prints. Can you tell me what this solution is? A. The following bath is recommended:

Solution I.

Water	24	ounces.
Hyposulphite of soda	4	" troy.
Fused acetate of soda	½	ounce "
Powdered alum	1	" "
Acetate of lead	⅛	" "

Solution II.

Chloride of gold	15 grains.
Water	8 ounces.

Boil the water and dissolve the hypo. while hot, then add the alum and acetate of soda. When this solution is cooled down to normal temperature it should be decanted, or, still better, filtered from the precipitate of sulphur, and then the acetate of lead, dissolved in about one ounce of water, is added. For use, take the following proportions: ¼ ounce solution II. to 8 ounces solution I. The prints should be placed in this bath without previous washing and toned in about five minutes, then immersed for one or two minutes in a checking solution composed of salt 1 ounce and water 16 ounces, then washed in two changes of fresh water, and to insure fixing it is advisable to immerse the prints for about two minutes in a fixing bath of:

Hypo	2 ounces.
Salt	½ ounce.
Water	32 ounces.

Then wash for one hour.

(5422) M. N. O. writes: I send you a small bug found in yellow pine logs after they have been cut for the sawmill. It is also found in the lumber after being sawed, this bug being taken out of a pine board in the yard. They ruin unknown millions of feet of No. 1 lumber every year, which has to be sold for No. 3 stock. They cut the logs and boards full of small holes, which are known in the business as "pin holes." They generally follow in the soft part of the grain. It does not disturb the pine until it is cut down. Can you tell me anything about it and suggest a remedy that would probably extinguish them? Reply by Prof. C. V. Riley.—The insect sent is *Platypus quadridentatus* 01, belonging to the coleopterous family *Scolytidae*. The numerous species of this family live either under the bark of trees or enter the solid wood. The few North American species of the genus Platypus belong to the latter class and infest many species of deciduous and coniferous trees. As correctly observed by Mr. Overton, they are not known to attack healthy trees; nor do they live in perfectly dry wood, but they develop in trees that are diseased or enfeebled from one cause or another, or in freshly felled trees and in the stumps of felled trees. Here the female beetles bore long galleries through the bark into the solid wood and deposit their eggs in short secondary galleries, which branch off rectangularly from the main gallery. When the trees are sawed up into boards, a transverse section through this network of galleries shows the dreaded "pin holes." There is no direct remedy for exterminating this and other species of scolytid beetles; but much may be done on the part of our lumbermen to prevent severe and continuous injury. The trees should be felled in the fall and winter and should be sawed up, if possible, before the warmer season commences. Felled trees that are allowed to remain in the woods for weeks or months during spring or summer are sure to get thoroughly infested by the beetles. Above all, the timely burning of the stumps, branches, and other waste portions of felled trees, of trees that are blown down by storms, etc., would greatly reduce the number of the beetles.

(5423) F. H.—Reply by Professor Riley. —The insect referred to by you is one of the most striking and singular insects of our fauna. The specimen sent is a female, and the remarkable fact about it consists in its very long and excessively narrow abdomen, giving it somewhat the appearance of a very slender-bodied dragon fly, except for its short wings and general resemblance to a wasp. In point of fact, it belongs to the group of insects including the wasps, parasitic flies, etc. and the male, which has a very ovoid abdomen, closely resembles the true wasp, but is very much more rare than the females, only a few specimens having been found, whereas the female sex is comparatively abundant. This anomalous insect is quite distinct from anything else in the insect world, and for it a special genus and family have been erected. It is known as *Pelecinus polyturator*, Drury, is closely allied to the parasitic ichneumon flies, and is undoubtedly parasitic on some other insect, probably a wood-boring species, although its host relations are entirely unknown.

(5424) D. L. R. writes: Please answer in SCIENTIFIC AMERICAN the following questions: 1. How many storage cells would it take to run a one-half horse power motor six hours a day? A. By taking a little over the standard current, four cells would answer. It would be better to use six cells. 2. How many gravity cells will it take to charge storage cell for the said six hours? A. Allow two and one-half gravity cells for each storage cell. For rapid charging, ten or twelve gravity cells for one storage cell. 3. Would the same cell give me twelve hours' run on Monday if I did not use it on Sunday? A. Rest over Sunday of a charged cell properly cared for would not perceptibly affect it. 4. How to temper small coil springs made out of No. 24 steel wire. A. Harden by heating on a piece of wire gauze held over a Bunsen burner. Draw temper with linseed oil at about 500° F. 5. How to get a copy of the *Patent Office Gazette*. A. Subscribe at Patent Office, Washington, D. C. It costs $5 per annum.

(5425) W. W., England, asks: 1. What is the quickest way to drill or pierce the stones used for watch jewels, what kind of drill, what made of, and what lubricant used for same? A. A revolving steel wire charged with diamond dust and oil is used for drilling watch jewels. 2. What is the best metal or material to use for frictional gearing? Which will give the best results for the above? The edge of small or driven disk to run against the face of large or driver disks with slow speed, reverse action, for very small tapping machine, to thread holes for watch screws. A. For a disk driver and small drill pulley, use leather glued to the face of the disk and pulley. Turn off the leather faces truly for the light work of making watch screws.

(5426) G. A. L., South Dakota, says: I have been told that ice frozen from artesian well water will not keep as long as other ice. Is this a fact, and why? A. There is probably only a very small margin of difference in the time of melting of artificial ice from artesian well water and ice frozen in the natural way, the difference being due to the method of freezing. This statement applies to any artificial ice made from hard water as against natural ice. The method of freezing artificial ice incloses all impurities and salts of lime within the mass, which may act to hasten its melting, whereas the freezing in the natural way discharges the salty impurities. This is why artificial ice manufacturers use distilled water for making ice. Such ice is not only clear, but will last fully as long as natural ice under like conditions.

NEW BOOKS AND PUBLICATIONS.

RESISTANCE OF SHIPS AND SCREW PROPULSION. By D. W. Taylor. New York and London: Macmillan & Co. 1893. All rights reserved. Pp. ix, 234. Price $3.75.

The science of ship building has at last, after many centuries, passed out of the empiric region to one of exactness. In the present work we find the modern calculation applied to the most recent examples. The value of the work is increased by very full tables, and diagrams are given wherever required. The absence of an index is compensated for to some extent by a very full table of contents, the work possibly being of too mathematical a character to lend itself to indexing.

DECIMAL CALCULATION. By Louis Neuschafer. Oshkosh, Wis.

THE FIRST FOUR VOYAGES OF AMERIGO VESPUCCI. Reproduced in facsimile, with translation, introduction. A map, and a facsimile of a drawing by Stradanus. London: Bernard Quaritch. 1893. Pp. x, 45. Price 75 cents.

This work in facsimile reproduces the text in Italian of the original account of the voyages of the famous navigator from whom America is supposed to have been named, and in addition thereto, the English translation of the letter is given. The work is a very interesting and attractive contribution to the Columbus year and is illustrated by a map and other facsimile woodcuts.

HARIOT'S NARRATIVE OF THE FIRST PLANTATION OF VIRGINIA IN 1585, PRINTED IN 1588 AND 1590.

This very curious publication, with facsimile illustrations of the inhabitants of Virginia as found there by the English, is a companion piece to the work just noted, and will be found an exceedingly interesting contribution to the literature alluded to. It should be stated that these two works form two out of a series of four works of the character published by the celebrated Quaritch.

THE SPANISH LETTER OF COLUMBUS. WRITTEN BY HIM ON FEBRUARY 15, 1493, TO ANNOUNCE THE DISCOVERY OF AMERICA.

This is one of the series of Columbian literature alluded to above. A translation into English follows the facsimile Spanish text.

REPORT ON THE EUROPEAN METHODS OF OYSTER CULTURE. By Bashford Dean. Washington: Government Printing Office. 1893.

This excellent work covers a field too little understood in this country. It describes the rational cultivation of oysters as carried on in different countries of Europe. It is made more interesting by the production of numerous illustrations showing the plant and appliances adopted abroad for the cultivation of the mollusks. At the present time, when American oysters seem really to be feeling the effects of the great draught made upon them by unscientific harvesting, this work has a peculiar value.

NORTH AMERICAN FAUNA. No. 7. Published by authority of the Secretary of Agriculture. (Actual date of publication, May 31, 1893.) The Death Valley Expedition. A biological survey of parts of California, Nevada, Arizona, and Utah. Part II. Washington: Government Printing Office. 1893. Pp. 393.

THE INFRINGEMENT OF PATENTS FOR INVENTIONS, NOT DESIGNS, WITH SOLE REFERENCE TO THE OPINIONS OF THE SUPREME COURT OF THE UNITED STATES. By Thomas B. Hall. Cincinnati: Robert Clarke & Co. 1893. Pp. 275. Price $5.

The keynote of this volume is found in a quotation from an opinion of the United States Supreme Court to the effect that no decision in patents can be considered fixed and correct until it has been passed upon by the Supreme Court. The work therefore, it is stated, is written with sole relation to the opinions of the Supreme Court of the United States, and is restricted to inventions, and not designs. The work seems excellently and systematically arranged. It gives concrete examples, and a sample of its system of treating this topic may be deduced from its treatise on the validity of the patent. Here the author gives twenty-four different heads into which the different premises which may affect the validity of a patent may be resolved. A list of the references, 673 in number, and an adequate index close the book.

SONGS IN SPRING TIME: THE PASSING OF LILITH, AND OTHER POEMS, INCLUDING INTERCEPTED LETTERS AND SAINT AUGUSTINE. By John Cameron Grant. Second edition. London: E. W. Allen. 1893. All rights reserved. Pp. xxi, 115. Price 80 cents.

THE HANDY SKETCHING BOOK FOR ENGINEERS AND DRAUGHTSMEN. RULED TO EIGHTHS OF AN INCH, WITH USEFUL TABLES. New York: Spon & Chamberlain. London: E. & F. N. Spon. 1893. Price 25 cents.

This sketch book is made up of cross-ruled paper for the entry of profiles and various diagrams in use by the engineer. It is evident that the same cross-ruled paper will admit of real estate diagrams, so that not only the architect, engineer, and draughtsman will be interested in it, but even the dealers in real estate. On the inside cover page some useful tables are given.

REPORT OF THE COMMISSIONER OF EDUCATION FOR THE YEAR 1889–90. Volume I. Containing Part I. Washington: Government Printing Office. 1893. Pp. xxvii, 601.

☞Any of the above books may be purchased through this office. Send for new book catalogue just published. MUNN & Co., 361 Broadway, New York.

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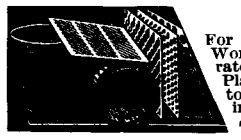
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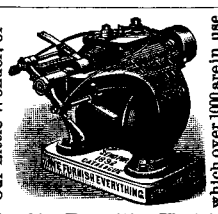

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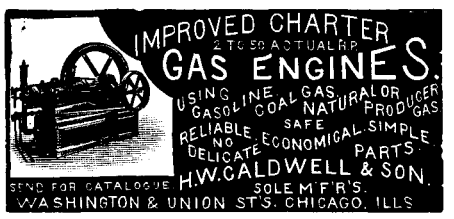

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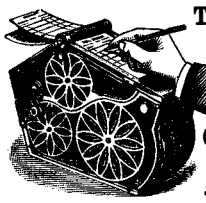
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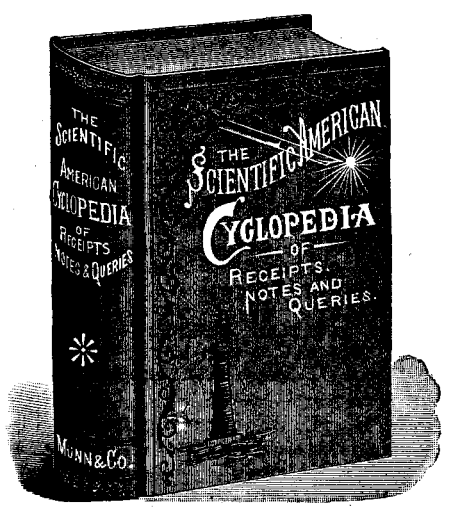

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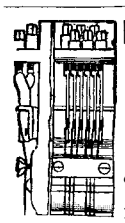

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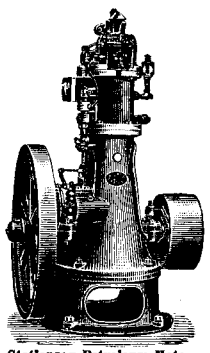

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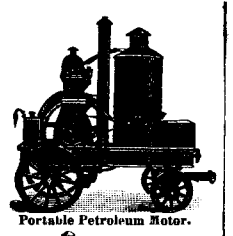

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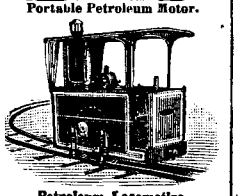

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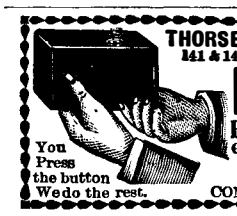

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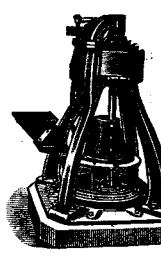

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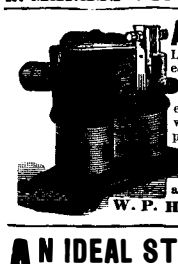

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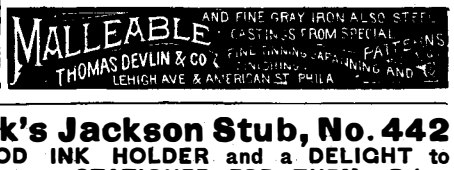

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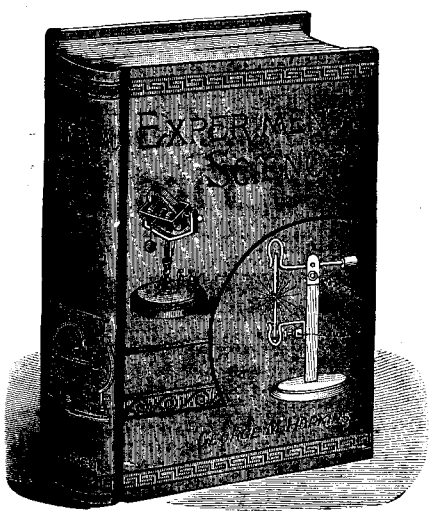

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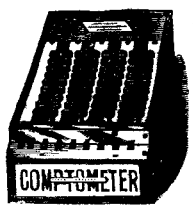

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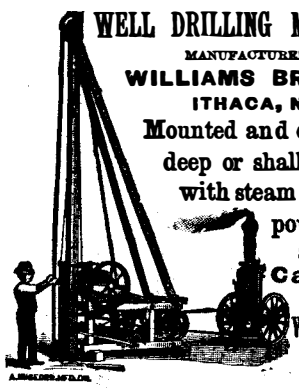

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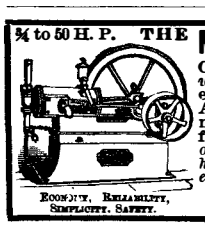

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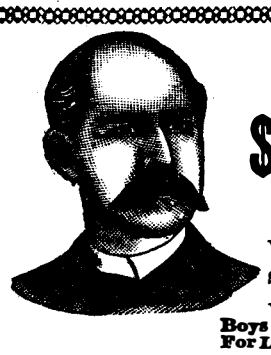

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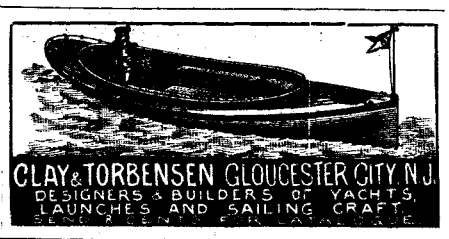

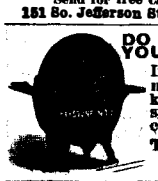

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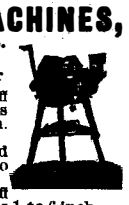

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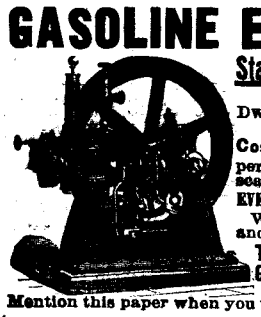

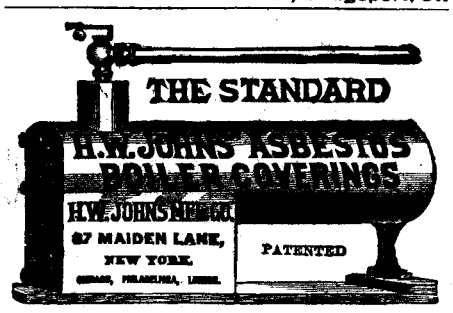

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